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Neurological speech therapy for toddlers with vocal cord paralysis – a holistic approach: case studies

Abstract: The theoretical aspect of the article presents dysphagia and dysphonia in children with vocal fold paralysis caused by surgical interventions – the causes, symptoms, diagnostic possibilities, as well as initial therapeutic recommendations. In practical terms, the authors would like to show methods of examining the voice and swallowing disorders in toddler patients who participated in the experimental-clinical trial at the University Children's Hospital in Krakow. The article discusses two case studies which were to be used to develop a standard of neurological therapy dedicated to this type of patients. The authors focused on presenting the relationship between the functional/myofunctional diagnosis, and the diagnosis of the prelingual and linguistic skills in children in terms of the development of linguistic and communicative competence. In this approach, myotherapy is to form the basis of activities necessary in the framework of early therapeutic intervention, which are to stimulate the speech development in children. In conclusion, the article specifies the therapeutic recommendations that have been developed on the basis of the research procedures presented.

Keywords: dysphonia, dysphagia, paralysis of vocal cords, logopedic diagnosis

Neurologopedyczna diagnoza dzieci w wieku niemowlęcym z paraliżem fałdów głosowych – podejście holistyczne. Studia przypadków

Streszczenie: Artykuł w zakresie teoretycznym przedstawia dysfagię i dysfonię u dzieci z porażeniem fałdów głosowych w wyniku oddziaływań operacyjnych – przyczyny, objawy, możliwości diagnostyczne, a także wstępne rekomendacje terapeutyczne. W aspekcie praktycznym autorki ukazują sposoby badania zaburzeń głosu i połykania u pacjentów w wieku niemowlęcym, którzy brali udział w próbie eksperymentalno-klinicznej w Uniwersyteckim Szpitalu Dziecięcym w Krakowie. W artykule omówiono dwa studia przypadku, które miały posłużyć do opracowania standardu postępowania neurologopedycznego dedykowanego dla tego rodzaju pacjentów. Autorki skupiły się na przedstawieniu zależności diagnozy funkcjonalnej/miofunkcjonalnej z diagnozą umiejętności prelingwalnych i lingwlanych dziecka w aspekcie rozwoju kompetencji językowej oraz komunikacyjnej. Mioterapia

w tym ujęciu ma stanowić podstawę działań, koniecznych w ramach wczesnej interwencji terapeutycznej, które mają posłużyć stymulacji rozwoju mowy dziecka. W podsumowaniu artykuł określa rekomendacje terapeutyczne, które zostały opracowane na podstawie zaprezentowanej procedury badawczej.

Słowa kluczowe: dysfonia, dysfagia, porażenie fałdów głosowych, diagnoza logopedyczna

Voice and swallowing disorders in toddlers are a widespread problem which many a specialist have to address – physicians, neuro-speech therapists, speech therapists and physiotherapists. The issue itself serves as a source of continuous research, series of discussions, reflection, and a pursuit of supportive solutions.

Breathing, phonation, eating, and drinking are considered primary when it comes to the sensorimotor aspects of speech development. The aforementioned functions also specify the masticatory organ as well as the muscles responsible for the facilitation of the articulators. Disorders in the area of the oro-facial complex might also contribute to changes in the quality of sounds produced.

Phonation (vocalization) and swallowing are intricate processes in which the oral cavity, the pharynx, and the esophagus play specific roles. The process of swallowing alone, involves as many as twenty-six groups of muscles, along with five pairs of cranial nerves, and three cervical ones (Narożny & Szmaj, 2014, p. 177). The same groups of muscles might be engaged in the correct functioning of breathing, phonation/vocalization as well as articulation (Boksa, 2016, p. 43). As regards the vocal cord paralysis, it is necessary to consider the diagnostics and holistic therapy because this disorder affects many an aspect of the patient's life.

Theoretical approach – postoperative vocal cord paralysis in toddlers: definition and symptoms, etiology

The post-operative vocal cord paralysis, VCP, is caused by laryngeal nerve damage. This disorder is not only difficult to diagnose, but also difficult as far as therapy is concerned. It is based on a unilateral, or bilateral paralysis of the vocal cords (folds), which cease to function properly and show limited mobility, they are thus unable to come together, or they do so in an insufficient manner, unable to perform their function in the scope of the respiratory, phonatory and articulatory systems, including the alimentary tract. In toddler-aged patients, those difficulties manifest themselves in various phases of dysphonia and dysphagia.

Dysphonia

Dysphonia is a disorder affecting the function of the vocal cords which perform the most primary functions of human physiology as they take part in the breathing process, and they prevent gastric content and saliva from being aspirated into the lungs. Apart from the basic function performed, vocal cords also allow for sound to be produced, leading to the creation of specific phones (sounds). Main symptoms of dysphonia include raspy, husky, and soundless cries/wails, which does not give the child the possibility to imitate and independently create sounds. Paralyzed vocal folds, or cords, also cause gagging on saliva or food. Symptoms of dysphonia also include a highly characteristic wheezy breathing, also called stridor, which points to a pathology of the airways, of varying degree. This, in turn, leads to breathlessness, or dyspnea, an increase in the number of breaths per minute, as well as shallow and irregular breathing. It might appear both during the time of rest, and also when performing various forms of activity e.g., baby's feeding. Hoarseness then develops along with a chronic cough, frequent regurgitation, or posseting, which occur right after meals (Jabłońska-Jesionowska & Zawadzka-Głos, 2019, p. 4). Stridor is considered dangerous to health, it might even be life threatening, especially in toddlers, or infants. Stridor might sometimes persist for months, or even years, while treatment and recovery often involve speech therapy support in order to enable the patients to recover their lost phonatory functions. Dysphonia of such type will be, in the light of future development of the child, the cause of delayed speech.

Dysphagia

Dysphagia stands for a disorder that involves swallowing, and forming of a bolus, its transportation from the mouth, through to the throat, esophagus and down to the stomach. These problems might appear in every phase of the swallowing process, while the etiology, just like in the case of dysphagia, will be identified as "multiple".

Waldemar Narożny and Marta Szmaj (2014, p. 178) have divided the causes of dysphagia into two groups – structural and neuro-muscular. As regards the vocal cord paralysis, the cause is connected with an improper function of the neuro-muscular dysphagia. Dysphagia manifests itself in gagging, or choking, drooling, or in food sticking in the mouth and throat, leading to shortness of breath, tiredness/fatigue, and also anxiety during rest and feeding. "What is especially dangerous in this case is the food content (bolus), of various consistency, being aspirated into the lungs, caused by the failure of the vocal cords to close, or their being »blanketed« by the

epiglottis, along with the blockage of pharyngeal muscles. In the case of patients with dysphagia, one should also take into account the problem of laryngopharyngeal reflux – where food finds its way into the nose (Tomik & Solowska, 2015, p. 33). "Dysphagia does not allow for free speaking because each attempt ends in a struggle to catch a breath or swallow saliva. Dysphagia, just like dysphonia, leads to speech retardation" (Knapek, 2020, p. 7).

Swallowing disorders in such patients also entail other abnormal reactions that involve the sucking, swallowing, or the pharyngeal reflex. (Mielnik-Niedzielska, 2016, p. 64). These reactions are especially important in the case of children of up the 6 months of age. They might manifest themselves in a decreased, or increased activity of those processes. Decreased reactions are caused by weaker facial muscles, which leads to the lack of closure, or a poor seal in the lips, cheeks, tongue, the jaw, as well as disorders of the rhythm and strength of sucking. The child is unable to suckle strongly enough, and it often gags when attempting to feed. Increased sucking and swallowing reflexes manifest themselves in a strong and quick manner of sucking. In addition, it is possible to observe satiety disorders (Rządzka, 2019, pp. 45–46). "Apart from breathing disorders, feeding immaturity might also occur due to deviations in oral reflexes. Apart from oral functions that involve sucking, drinking, and swallowing, these reflexes also include rooting, phasic biting, mouth opening, sticking out the tongue, reflex responses on the part of the lips and jaw, the gag reflex, as well as biting, and chewing which come at the later stage of the development" (Rządzka, 2019, p. 17).

Etiology

With the subject matter of the article in mind, more attention should be drawn to vocal cord paralysis caused by cardiosurgical procedures. Enrique García-Torres et al. (2019, p. 361) have proven that postoperative paralysis might occur in 12% of such patients. The same phenomenon was observed by Hussam Hamadah and Mohamed Kabbani (2017, p. 2), who also concluded that the paralysis might lead, in 45% of the cases, to aspiration, and also, in 27% of the cases, to a situation where performing the surgical intervention again is necessary. One should keep in mind that such complications might also occur following other types of medical procedures that require intubation, for example thyroid surgery, or neurological and oncological procedures. Dysfunctions in that area most certainly require speech therapy (Horton, Atwood, Gnagi, Teufel & Clemmens, 2018).

Other causes of vocal cord paralysis in toddlers might include malformation syndromes (these pertain to anatomical abnormalities), prematurity as well as intu-

bation as a result of respiratory disorders. Congenital disorders include, among other things, the Williams syndrome, the Möbius syndrome, and the *cri du chat* syndrome (Błeszyński, Fordham & Vece, 2016).

Researchers (García-Torres et al., 2019, p. 362) concluded that the factors which increase the incidence of VCP occurring postoperatively include prematurity, with the specification of the exact week in which the childbirth took place, birth weight, as well as body mass during surgery. Jad Jabbour, Michael Uhing and Thomas Robey (Jabbour et al., 2017, p. 585) specifies VCP as the second most frequent anomaly of the larynx in newborns, almost 50% of whom were born prematurely. This concerns all the children who were operated on or intubated due to respiratory disorders, as well as patients with concomitant diseases of the nervous and respiratory systems (García-Torres et al., 2019, p. 364). Some researchers claim that premature infants are exposed to "a greater risk of dysphonia at a later stage, in comparison to peers born at full term" (Jabbour et al., 2017, p. 585). Jennifer Ha (2020) emphasized that in the case of VCP, year by year the number of cases of pharmacotherapy provided, as well as cases of neurological speech therapy, is decreasing as compared to the number of surgical procedures performed.

Neurological speech therapy for vocal cord paralysis in toddlers

From the medical perspective, both in Poland and abroad, and as far as VCP is concerned, the diagnosis of dysphagia is most often given by way of an objective examination, for example radiological or video fluoroscopic (Narożny & Szmaj, 2017, p. 181; Nguyen et al., 2016; Stoudemire, Fordham & Vece, 2018). From a medical standpoint, one should also examine the ability to elevate the hyoid bone with the larynx, sensitivity of the mucosa within the pharynx during the process of swallowing, and the incidence of coughs or pharyngeal gags. "It is of significant importance to diagnose the anatomy and physiology of the lips, the tongue and palate, the facial muscle tone, the jaw's mobility, the condition of the mucosa, and the sensory disorders. It is necessary to determine whether the saliva, or the gastric content remain within the lingual-epiglottic valleculae, in the piriform recesses, and in the laryngeal vestibule" (Obrębowski, Wiskirska-Woźnicka & Obrębowska, 2018, p. 371). The condition of the glottis is also of significant importance, as the vocal cords located at the rear, are exposed to numerous lesions as a result of frequent choking (Obrębowski et al., 2018, p. 371). Researchers unanimously agree that the most

serious symptom of dysphagia are the 'silent aspirations' (Narożny & Szmaj, 2017; Obrębowski et al., 2018).

In Polish literature as well as the in practice of speech therapy, standards of logopedic help procedures have been specified for newborns and toddlers (Przybyla, 2015). Olga Przybyla draws the attention to the analysis of results of specialist research, the assessment of the motor development, the muscle tone, the assessment of behaviors and motor functions (e.g., reflexes in toddlers, muscles, and muscle tone in the orofacial region). As regards the procedure in the scope of early logopedic intervention designed for the orofacial region of newborns and toddlers, much and more can be found in the works written by Anna Regner (2016) as well as Beata Pusz (2016). However, there are no standards, or norms of conduct in the case of voice and swallowing disorders in children suffering from vocal cord paralysis. When establishing a logopedic diagnosis of such type, children may be supported thanks to three non-standardized neurologic speech assessment sheets: *Karta prymitywnych noworodkowych reakcji oralnych (PNR)* (The oral primitive reflex sheet for newborns) prepared by Mira Rządzka (2019, pp. 101–102); *Karmienie piersią, karmienie butelką. Karty obserwacji* (Breast feeding, bottle feeding. Observation sheets) by Marzena Machoś-Nikodem (2018), as well as *Ocena neurologopedyczna niemowlęcia od 0–12 miesiąca życia. Ocena odruchów ze sfery orofacjalnej oraz umiejętności istotnych dla rozwoju mowy* (Neurologic speech assessment of babies not older than 12 months. Orofacial reflex assessment and the assessment of key skills for speech development) devised by the aforementioned researcher, together with Magdalena Czajkowska (Machoś & Czajkowska, 2019).

Clinical assessment of dysphagia, which is performed by a speech therapist, is based on an observation of a parent and a baby during feeding, examination of the area of the oral cavity, verbal behaviors as well as child observation before and after feeding (Nguyen et al., 2016). The remaining clinical trials, e.g., involving swallowing water, are not possible until the child is 2 years old (Nguyen et al., 2016). In their regular review of the diagnostic tools used to examine difficulties with swallowing in newborns and toddlers, Nickolas Audag, Christophe Goubau, Michel Toussaint and Gregory Reychler (2017) as well as Isuru Dharmarathna, Anna Miles and Jacqui Allen (2019) drew their attention to the medical procedures. Renée Speyer et al. (2017) discussed the existence of non-instrumental attempts used by interdisciplinary teams to examine voice and swallowing disorders. The authors performed a psychometric assessment of ten (out of 22) questionnaires for the sake of assessing the ability to swallow. Only ten were taken into account since the remaining 12 did not carry any psychometric data. The researchers included the following: Brief Assessment of Motor Function: Oral Motor Deglutition Scale (abbreviated into BAMF-OMD),

Children's Eating Behavior Inventory (abbreviated into CEBI), Dysphagia Disorder Survey (abbreviated into: DDS), Multidisciplinary Feeding Profile (abbreviated into: MFP), Neonatal Oral-Motor Assessment Scale (abbreviated into: NOMAS), Oral Motor Assessment Scale (abbreviated into: OMAS), Pediatric Assessment Scale for Severe Feeding Problems (abbreviated into: PASSFP), Pre-Speech Assessment Scale (abbreviated into: PSAS), Preterm Infant Breastfeeding Behavior Scale (abbreviated into: PIBBS), as well as Schedule for Oral Motor Assessment (abbreviated into: SOMA). The most credible questionnaire used to assess deglutition is the DDS. Further research in that scope is necessary to support the scale used to assess the difficulty with deglutition and feeding with scientific evidence, which would be used by pediatricians, laryngologists, and neuro-speech therapists. The lack of accuracy and credibility during the non-standardized attempts hinders their widespread use. None of the aforementioned scales is solely dedicated to examining children with dysphagia and dysphonia caused by vocal cord paralysis. In this case, as in the case of Polish literature, there seems to be a research gap.

The authors of the article have not managed to reach any publication which would be devoted to neurological speech therapy for voice and swallowing disorders marked by an etiology of vocal cord paralysis as a result of operative procedures in toddlers. To date, this subject matter has been addressed in medical papers. It is really necessary to apply a holistic and multi-disciplinary approach to restore and maintain patients' wellbeing. It is of key importance to recognize that the use of myotherapy in the orofacial region is becoming fundamental at later stages of the speech development in children.

Magdalena Knapek states that "patients suffering from vocal cord paralysis are less effectively fed, they gain less weight, are at a greater risk of aspirating food into the lungs, which results in deglutition pneumonia as well as fungal infections in the area of the mouth and the throat. In addition, recurrent choking, or hypoxia might lead to slow and minimal pathological changes in the region of the brain, and also to neurological disorders" (Knapek, 2020, p. 4).

The research problem and its methodology

The authors of the article formulated a research question that reads: Which principles of logopedic diagnosis should be applied in the case of toddlers with dysphonia and dysphagia caused by vocal cord paralysis?

In order to present the chosen research problems well, the case study method has been applied. For the sake of fulfilling the principles of the research method, the researchers were guided by the formulation of the research problem, by the specification of a framework plan in the form of a diagnosis, a problem and by therapeutic activities.

The venue and the participants of the study

Authors of the article, during their voluntary work at the University Children's Hospital in Cracow from July 2018 to December 2019, worked on a description of the principles of logopedic diagnosis for children with dysphagia and dysphonia caused by a paralysis of a single vocal cord, or both cords. Logopedic studies were conducted by a multidisciplinary team of specialists, including a laryngologist. Children's guardians were notified of the studies conducted, they also consented in writing to the adopted research procedures. The aim of the research was to prepare a proper therapeutic program, and above all, to establish principles for logopedic procedures in the cases which were described.

The logopedic study was based on the assessment of the phonatory ability of children, and also their feeding functions. Thanks to an accurate diagnosis, it was possible to specify the optimal therapeutic recommendations. Below are two examples of case studies presented by the authors.

A girl, born on February 2nd, 2019

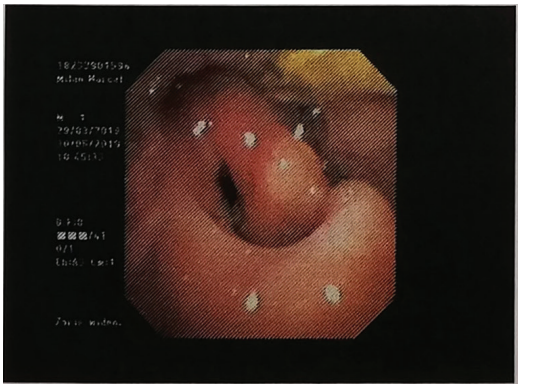

Figure 1. Examination using a video fluoroscope
Source: Photograph taken by the author.

1. Medical diagnosis: heart defect, critical pulmonary valve stenosis of the pulmonary trunk, tricuspid insufficiency. A preterm born in the 34th week of pregnancy (twin pregnancy).

2. Treatment: operated on the 13th day, stayed within the intensive care unit for 3 months. In the 6th month, the patient was operated on again (the procedure fraught with complications took no less than 9 hours, the patient had to be reanimated multiple times). The patient had a feeding tube inserted for 1.5 months. Fiberoptic bronchoscopy: the nostrils were bilaterally patent, with thick mucus visible, the nasopharynx was clear, the pharynx was normal, the larynx and glottis were clear, the left side of the larynx was found to be immobile, the vocal fold was in neutral position, the right vocal fold was found to be mobile, although an absence of closure was identified – with the escaping air causing wheezing, rima glottidis was wide, there was no dyspnea during resting or crying, subglottic edema was not found. No closure between the vocal folds causes deglutition disorders. Paralysis of the laryngeal fold. Recommendations: Nivalin.

3. Logopedic diagnosis established in the 3rd month: dysphonia, dysphagia.

4. During history taking it transpired that the child does not put on weight (weight at birth 1,700 g), has an aversion to eating, chokes on food, cries, seems anxious.

A boy, born on September 20th, 2019

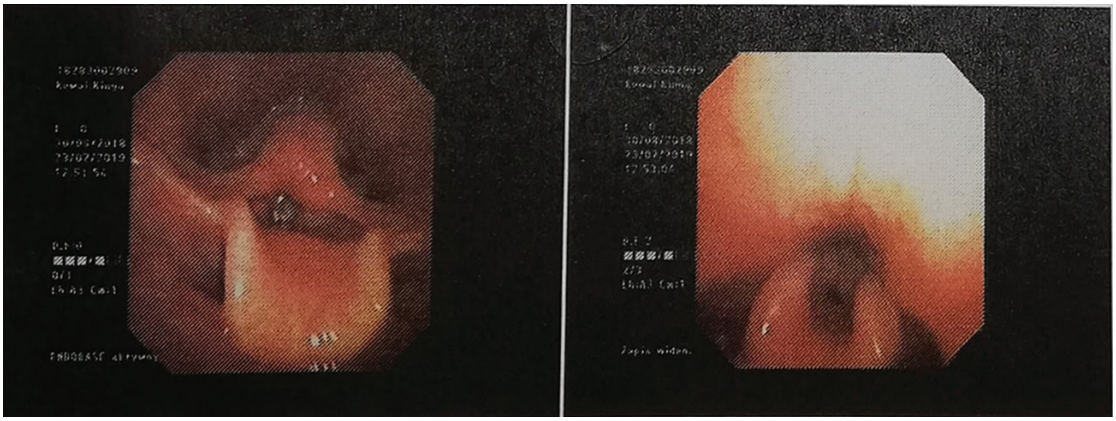

Figure 2. Examination using a video fluoroscope
Source: Photograph taken by the author.

1. Medical diagnosis: right aortic arch with an aberrant left subclavian artery – with an extraesophageal route of that artery. Vascular ring. Bilateral cleft lip together with cleft (hard) palate. Impaired binaural hearing due to exudative otitis media. A preterm born in the 35th week of pregnancy.

2. Treatment: surgical division of the vascular ring performed on December 5th, 2019. The course and healing of the wound went without any complications. Fiberoptic Bronchoscopy performed trans-nasally on December 5th, 2019. Post-surgery condition – hoarseness was found. Larynx: the epiglottis was clear, mobile, the right side of the larynx was mobile too, the right vocal fold was unable to reach the left, the left side of the larynx was found to be immobile, the vocal fold in neutral position. There was a narrowing of the rima glottidis caused by the paralyzed fold. Laryngeal mucosa was markedly red. Diagnosis: paralysis of the left side of the larynx, laryngitis, stridor (antibiotic and Nivalin recommended).

3. Logopedic diagnosis provided in the 3rd month of the child's life: dysphonia, dysphagia, palatine dyslalia.

4. Based on the information gathered during the history taking, the course of the pregnancy was "without complications". The mother felt well, however, during the prenatal examination it transpired that the boy had a heart defect, together with cleft lip, alveolus, and palate. It might be assumed that in that case the facial dysmorphia was hereditary as the father also had cleft lip and palate.

5. The child was delivered through a C-section due to the heart defect, in the 35th week, Apgar 8. According to the mother, there were problems with feeding, the boy choked and gagged on food, was unable to suckle, would greedily bite on the bottle, while during feeding, wheezing sounds were audible. The wheezing appeared also during normal breathing.

Tools of logopedic diagnosis

Validation of the non-standardized observation sheets is a crucial element of the research. It should be performed in the best possible way so that a diagnosis of children suffering from dysphagia and dysphonia caused by vocal cord paralysis, could be established. Such a validation is based on an assessment of psychometric features of a tool which is translated from a different language. The application of the translated tool in our country, and the maintaining of psychometric equivalence is possible thanks to the cultural adaptation performed (Gawlik & Kurdas, 2014, p. 27). In the cases described, the said validation was understood as a change to the questionnaires used, and as their adjustment to the needs of the patients being diagnosed (Saunders et al., 2013). *Karta prymitywnych noworodkowych reakcji oralnych (PNR)* has not been modified as in the cases of patients described it was possible to examine the

oral reflex actions (the children were not older than 6 months). The questionnaire *Karmienie piersią, karmienie butelką. Karty obserwacji* was used only in the section where it concerned the assessment of bottle feeding, however, the subsection that pertained to toddler reflexes was not used. Due to physiological complications as well as anatomical conditions, the patients under examination could not be breastfed.

During the diagnosis, detailed observations were conducted, and notes were taken on the following: primitive oral reactions (normative and pathological) (Rządzka, 2019); non-nutritive chewing, non-nutritive sucking (lateral movements of the tongue, raising and sticking out the tongue, the incidence of an upper lip blister or its absence, the sounds that accompany the process of sucking, suggesting a leakage, or an insufficient labial sealing, the position of the tongue reacting to the chin being pulled away, the ability to latch onto the teat, the feeding position); nutritive sucking (opening the mouth in order to latch onto the bottle); labial sealing; sucking – swallowing – feeding coordination; rhythmicity of sucking; the time of feeding (Machoś & Czajkowska, 2019). The observation of irregular reactions to feeding, such as eructation, posseting, tensing up, anxiety and crying is of significant importance (Machoś & Czajkowska, 2019).

A comprehensive logopedic diagnosis, in accordance with neuro speech therapy recommendations (Rządzka, 2018, p. 405), was based on multiple elements, such as the information obtained from parents and guardians during the history taking, in which all past diseases, procedures, as well as past pharmacotherapy were included. The next stage involved the assessment of:

- the anatomy and physiology, especially the muscle tone of the orofacial tract,
- respiratory functions – the rhythm and adverse sounds that accompany the breathing,
- phases of swallowing,
- the voice,
- prelingual activities,
- psychomotor development.

The assessment of the voice and the phases of swallowing was not included in the principles of the logopedic diagnosis which the authors of the study referred to, however it was added by them for the sake of completing the empirical research.

Specification of the methods of providing food to the children, chosen by the medical staff, was of key importance to the study. Three feeding options were observed: through a feeding tube and a bottle, and by means of a bottle alone.

The physical examination thanks to which an assessment of the anatomy and physiology of the orofacial tract was performed constituted a common denominator in establishing the medical diagnosis and neuro speech therapy. What differentiates

the said diagnoses is the functional approach to the patient who, from the logopedic perspective, is a child that requires feeding, drinking and speech training. Speech therapy is in principle a set of long-term activities, dedicated to building up specific skills of the patient. The aim of the medical procedures is not only to optimize the feeding skills of a child at a given moment, but also to discharge the patient from hospital.

Logopedic diagnostics based on case studies

During the logopedic diagnosis, medical history was taken with the mothers. On the basis of the anatomy and physiology assessment, it was established that the boy suffered from cleft lip, alveolus, and palate. Tension in buccal, jugular, mentalis, hyoid, and lingual muscles was markedly weakened. The function of the orbicularis oris muscle, as well as the muscles in the corners of the levator anguli oris was found to be ineffective. The assessment of respiratory functions showed disorders in the scope of the rhythm (non-rhythmic breathing, slightly faster) and in the sounds that accompany breathing. What is more, the following symptoms appeared: adverse wheezing and a lack of respiratory coordination during feeding. As a result, the patient would often choke while the discharge would remain in the upper part of the esophagus. As regards the girl patient, however, poor orbicularis oris muscle tone was observed along with difficulty in the suckling coordination, swallowing, and breathing.

In some of the areas, the oral reflex actions of both of the children did not develop in a normative way. Even though the lack of the suckling reflex was observed, the swallowing reflex remained. The rooting reflex was slightly weaker, while the increased phasic bite reflex compensated for the lack of the ability to suckle in those children. The reflex action that involves the mouth being opened and closed, as well as the tongue thrusting reflex were considered normative (excluding the full lip closure). The gag reflex was oversensitive, which caused additional difficulty when feeding. The extrusion reflex action was assessed as normal, just like the mandibular reflex and the tongue thrusting/ licking. The lateral tongue reflex was slightly weaker in the boy, probably due to the anatomical-physiological development connected with the clefts as well as lower muscle tone which did not allow him to achieve the optimal resting position of the tongue (Pluta-Wojciechowska, 2009).

Swallowing phases at each of the stages were considered non-normative. In the oral phase, the food was abnormally transported into the pharyngeal cavity which

caused its regurgitation into the nose, or from the esophagus back to the pharynx and oral cavity. As a result of that, milk residues were observed on the tongue, in the pharyngeal section of the oral cavity, both in the boy and the girl.

The voice assessment in such small patients had been complicated, possible only in the case of crying and wailing. The children did not coo or babble, so it was impossible to assess other sounds. Without a fiberscope / an endoscope, it was also difficult to check if there had been any deterioration in the area of one of the vocal folds, or both. Paralysis of one of the folds can sometimes prevent patients from making any sound. Crying and wailing were visible in the facial expressions of the children, sporadically it was even possible to make out hoarser breathing. Verbal skills of the boy, which were delayed due to a cleft in primary and secondary palate, did not enable the child to develop cooing, which had been the cause of disturbed development of prelingual functions. In the girl on the other hand, the lack of cooing might have been caused by the complications that resulted from a surgical procedure. Only the communicative and social competence was assessed as normal in that area, i.e., the eye-contact and smiling.

On the basis of the questionnaire prepared by Machoś and Czajkowska, it was observed that the boy wound not suck the teat, nor fingers, or even an empty bottle. On closer examination, the lingual frenulum was found to be slightly shortened, which hampered the lateral movements of the tongue, especially at its tip. The child was unable to raise the tongue, but it would move the tongue out into the lower section of the lip. The phase bite reflex was normal, the suck blister did not appear, while accompanying sounds were heard during feeding/swallowing. When the chin was pulled away, the tongue would be positioned at the bottom of the oral cavity. The boy was unable to latch onto the pacifier – he would get irritated and would spit it out at once. The feeding position would maintain the center line. In the case of the girl, during attempts to change from the feeding tube to bottle feeding, due to the oversensitive gag reflex, each time the teat would be used, food regurgitation or choking would occur. Aversion to eating, crying, and wailing were clearly visible.

During feeding, the children would open their mouths according to the norm, however they experienced problems with latching onto the teat, so eventually they would perform compensatory phasic bites, using the sides of the gums so as to make use of the bottle. At that time, the labial sealing or the pumping motion was not observed, as the milk would leak out of the corners of the mouth, milk and saliva bubbles would appear together with mouth breathing and wheezing. The feeding process had to be interrupted because the children would tire during simultaneous mouth breathing and eating. The sounds of the food being swallowed was very audible, non-rhythmic, choking would also occur. The milk would spill out of the nose,

while the remaining and regurgitating food would cause reflux. The feeding would take less than 10 min. After feeding, the boy was anxious, while the food would often be brought up. Similar symptoms appeared in the girl patient, who reacted with mute crying and anxiety.

In the 3rd month, as part of the therapeutic sessions in logopedic care, the children were diagnosed as children suffering from dysphonia and dysphagia. The mute and wheezing crying/wailing were considered as indicators of dysphonia. Dysphagia, on the other hand, manifested itself in the form of choking on saliva and liquid foods, with food sticking in the oral and pharyngeal cavity, breathlessness occurred during resting periods and eating, there were also fatigue and anxiety during feeding. Difficulty in the area of primary coordination functions was observed.

Logopedic diagnosis of the children with this type of disorders is necessary for therapeutic reasons in the scope of eating and swallowing. Such diagnosis is of key importance for children to develop properly, not only in the cognitive sphere, but also in the physical and linguistic. Without a proper diagnosis, it will not be possible to formulate optimal therapeutic recommendations. Diagnosis and therapy offer the possibility of regulating the disturbed processes and halt the development of pathological reflex actions. Cooperation between a speech therapist and a laryngologist, as well as a physiotherapist, or an osteopath becomes necessary due to the need to monitor the course of the patient's therapy and potential lesions that take place in the sphere of sound and swallowing.

It is also incredibly important to conduct an indirect therapy with parents and guardians of the children. A speech therapist should discuss the recommendations in the scope of how the child assumes position during feeding, the amount and type of products provided, preventive measures against choking, or food getting caught within. Thanks to the advice, the parents could conduct an indirect therapy with the child during the time spent together on playing, changing, or bathing, which is helpful in developing communication skills.

Conclusions

Paralysis of a single vocal cord / both vocal cords constitutes damage which manifests itself in dysphagia, i.e., problems with feeding and swallowing, as well as dysphonia – voice disorders. As a result, less efficient feeding might occur in children with this type of diagnosis, resulting in a poor weight gain, as well as choking during

feeding. In consequence, this might lead to aspiration, aspiration pneumonia, as well as fungal diseases in the oral and pharyngeal cavity. In addition, digestive problems might appear, as well as anxiety. Choking results from swallowing disorder – the vocal cords fail to produce a normative closure, together with the epiglottis, and there is no proper function on the part of the lateral neck muscles. Occasionally, difficulty with the proper shifting of the trachea to the front might also appear. Children with laryngeal area paralysis feature weakened voice – when crying, no wailing can be heard, only weak murmur/ drawn-out sounds as well as forced pharyngo-laryngeal sounds.

As far as voice disorders are concerned, it was necessary to listen closely to the sounds produced by the children during phonation – both when crying, and when trying to coo. In the process of diagnosing children with vocal fold paralysis caused by cardiological surgeries, the necessity to monitor the child's breathing and pulse on an ongoing basis proved especially difficult, or challenging. During prolonged crying spells occurring, for example, during the speech therapy, the vital functions would sometimes worsen, which could have led to the general deterioration of the child's condition. In such situations, the examination required considerable precision and experience. Even though phonation disorders are uncomfortable for patients, eating by mouth generates even greater levels of stress. Patients suffering from dysphagia, with vocal cord paralysis, might suffer from chronic choking, which might lead to an oversensitive gag reflex. On the basis of observations and studies conducted, a correlation was observed between children born prematurely and feeding by means of a tube, and dysphagia, manifesting itself in an aversion to eating, trying new food, diet extension, as well as picky eating. Providing a diagnosis and a therapy for such patients is, therefore, considered as the most efficient method, on condition that it takes places within an interdisciplinary team.

As a consequence of the said problems, delayed speech development might occur. As regards the cases described, the treatment, and above all the speech therapy should include support for respiratory and feeding functions. The sooner these therapeutic procedures are initiated, the greater the chance that these ailments will cease, and that the child will develop in a normal way.

The authors have also observed that in the source literature, usually of medical nature, there has been a discussion concerning the medical procedures as well as a proposed therapy in the form of surgery, or pharmacological treatment. Speech therapy, which was devised on the basis of applied principles of diagnostic processes, constitutes an alternative variant to medical therapy, or its supplements.

The authors, on the basis of diagnostic procedures conducted, as well as the results received, created a proposal for the therapeutic program which currently constitutes the basis for the studies conducted. The most essential elements of that program include:

- respiratory stimulation conducted by the therapists;
- positioning, nursing and therapeutic feeding of the child;
- support for coordination between the provision of food and the process of swallowing;
- therapeutic massage;
- the elastic therapeutic tape, which is supposed to assist the function of skin and muscle tissues in the region of the larynx, the face, the neck, the thorax, and the abdomen.

From a holistic viewpoint, the specification of standards of logopedic therapy, with special emphasis on the diagnosis and therapy, is the key to performing the activities of speech therapists and other specialists. This guarantees an improvement in the lives of small patients not only in terms of the primary functions, but also the cognitive and communication skills.

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