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ORIGINAL ARTICLE

How can the process of postnatal adaptation be changed by the presence of congenital abnormalities of lip and palate

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ABSTRACT

Despite modern approaches in molecular biology and genetics, we are still not able to identify the actual cause in more than 50% of all congenital defects. One-half of the unidentified cases is referred to as "multifactorial". Detailed prenatal investigation of the fetus can discover the presence of congenital abnormality, which can worsen the process of postnatal adaptation. Retrospective analysis of newborns admitted to the Neonatal Department of Intensive Medicine (NDIM) in 2012–2016 with the aim to analyze how the process of postnatal adaptation can be changed by the presence of congenital abnormalities of lip and palate. During a five-year period, 13 newborns were admitted to NDIM (2 premature; 11 term newborns). Chromosomal abnormality was confirmed in one patient (Down syndrome) and in one patient suspicion of Patau syndrome was found. Twelve newborns had complete cheilognathopalatoschisis. Two premature newborns and two term newborns had perinatal asphyxia. In this group of patients, 33% had respiratory insufficiency without the presence of congenital heart abnormality, 66% had congenital heart abnormality with respiratory insufficiency, and 2 patients had feeding problems. Only one patient had a positive family history. The diagnosis of complete cheilognathopalatoschisis was confirmed prenatally only in 9 patients. We confirmed that clinical consequences of congenital abnormalities of lip and palate depend on the nature, localization and range of abnormalities, as well as on the genetic background and accompanying congenital abnormalities. Prenatal confirmation of the presence of congenital abnormalities has an important influence on the postnatal management of a patient.

KEY WORDS: newborn; cheiloschisis; palatoschisis

Introduction

The process of postnatal adaptation in the newborn is formed by a complex of intensive changes. The most important phase is a prompt switch of function of the respiratory system. The effectiveness of sufficient respiratory effort depends mainly on the maturity of the newborn and on the quality and amount of surfactant that has a direct effect on the functional ability of the alveolus. Individual phases of postnatal adaptation are normally fluent.

Congenital disorder is a condition existing at or before birth, regardless of the cause. Those characterized by structural deformities are termed "congenital anomalies" and involve defects in the developing fetus. Any substance that causes birth defects is known as a teratogen. Some disorders can be detected before birth through prenatal diagnosis (screening) (Jelinek *et al.*, 1983; Ujhazy *et al.*, 2005a, 2005b, Ujhazy *et al.*, 2012).

Cleft lip, cleft lip and palate, and isolated cleft palate, are collectively termed oral clefts and are the most common congenital anomalies of the head and the neck (2.1 per 1000 live births) (Vasudeva & Mistra, 2016).

Syndromic oral clefts (OCs) are present in patients with recognized congenital syndromes or with multiple congenital anomalies. They are typically caused by chromosome abnormalities and defined as monogenic syndromes. Nonsyndromic (isolated) OCs are present in patients without associated anomalies or developmental delays. A number of different gene mutations can affect the phenotype, including mutations of some of the genes involved in syndromic OCs, which suggests that there is a

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significant overlap between syndromic and nonsyndromic OCs (Venkatesh, 2009; Burg *et al.*, 2016).

Congenital abnormalities of the lip and palate can change the quality of postnatal adaptation. The lips are necessary for sucking and an optimally developed palate separates the respiratory and alimentary system in their upper part and prevents direct communication between them. Oligohydramnios can play also a role since lack of amniotic fluid leads to deformation of chin and subsequent impaction of the tongue between palatal shelves.

Cleft lip (cheiloschisis) is a congenital abnormality visible on the face immediately after birth. Isolated cleft palate (CPO) is the rarest form of oral clefting. The incidence of CPO varies substantially by geography from 1.3 to 25.3 per 10,000 live births, with the highest rates in British Columbia, Canada and the lowest rates in Nigeria, Africa (Burg *et al.*, 2016).

Reasons for the formation of a cleft are various. In many cases there is a combination of genetic and environmental factors (Blender, 2000). Lack of mesodermal reinforcement of the junction between nasomedial and lateral facial processes at approximately 6 weeks of gestation is responsible for the formation of cheiloschisis. Positive family history of the cleft of lip and palate increases the probability of their occurrence. In some cases, it can be part of a genetic syndrome. Environmental factors include abuses of the mother during pregnancy (alcohol, cigarettes), disease of the mother (diabetes mellitus, viral infection) and drugs (anticonvulsant drugs, methotrexate) (Molina-Solana *et al.*, 2013).

The incidence of cheiloschisis is higher in males. Cleft of the lip is mostly located on the left side. It can be unilateral or bilateral. The presence of median cleft lip (in association with microcephaly, hypotelorism) as the result of impaired junction of mandibular processes is but rarely confirmed. Cheiloschisis can be in combination with cleft of the palate (cheilognathoschisis). It may be part of a syndrome or caused by chromosomal abnormality.

The aim of treatment is to form muscle continuity in lip and plastic surgery of surrounding tissues. Optimal plastic correction improves the ability of the patient to suck. Timing of primary operation of cleft of the lip for unilateral cleft is the age of 3–6 months and for bilateral cleft also the age of 3–6 months. Timing of secondary correction of the cleft of the lip is at the age of 5–6 years.

Cleft palate (palatoschisis) is a congenital abnormality that originates in incomplete closure of the palate between 7–12 weeks of gestation.

Different forms of palatoschisis are described: isolated cleft of the soft palate, isolated cleft of the hard palate, complete cleft of the hard and soft palate, unilateral or bilateral or median, complete or incomplete. Submucous cleft of secondary palate posterior to the incisive foramen is usually noted by the presence of a bifid uvula (Burg *et al.*, 2016).

Clinical problems in newborn with palatoschisis, in comparison with cheiloschisis, are more prominent. Palatoschisis affects mainly the feeding ability in newborn. It can also cause aspiration during feeding or frequent incidence of otitis media.

Combination of the cleft lip with cleft palate worsens the phase of postnatal adaptation (Jelinek *et al.,* 1983).

Pierre-Robin syndrome with characteristic presence of retrognathia and/or micrognathia can be joined with cleft palate (in the majority of cases a midline posterior cleft of the palate is present) (Pala & Sonvanshi, 2016). Smaller mandible (restriction of prenatal mandible growth) is responsible for movement problems of the tongue. The tongue is displaced posteriorly and then falls back into the pharynx and causes obstruction of airways. In combination with the cleft palate, breathing problems are dominant. Special care must be taken in this syndrome, because lying on the back can worsen the clinical status of the newborn due to the presence of obstructive apnea. Insertion of the airway can improve breathing, since the end of the airway pushes the tongue forward. An optimal position is lying on the abdomen, but the newborn must be connected with a pulse oximeter. Sometimes it is necessary to use distension therapy – continuous positive airway pressure (CPAP); in the worst cases tracheostomy is indicated.

Detailed physical investigation of the oral cavity is important for detection of palatal cleft, mainly in the case of a cleft of the soft palate and uvula. Diagnosis can be established also prenatally. Before surgery of closure of the palate we can use temporary plate (it can be joined with formation of mucosal decubites), a special feeding bottle with prolonged nipple or orogastric tube. Timing of the cleft closure is very important.

Aim and methods

Retrospective analysis of newborns admitted to the Neonatal Department of Intensive Medicine (NDIM) in 2012–2016 with the aim to analyze how the process of postnatal adaptation can be changed by the presence of congenital abnormalities of the palate.

Results

Analysis of results is presented in Table 1.

Discussion and conclusions

During a 5-year period, 13 newborns were admitted to NDIM (2 premature; 11 term newborns) with visible congenital abnormalities of the face.

The most common congenital abnormality of the face in our group of patients was cheilognathopalatoschisis (93%), which was an expected finding as it appears in 2.1 per 1000 live births (Vasudeva & Mistra, 2016). Only patient number 13 had a positive family history. The highest incidence is known to occur with positive family history. Systematic examination of primary and secondary palates using three-dimensional (3D) ultrasound aids in the identification of orofacial clefts in the first trimester is

Table 1. Characteristics of patients.

Child No.	Maturity (g. w.)	Birth weight/ birth length	Establishment of diagnosis		Face deformities	Other anomalies and postnatal complications
			prenatal	postnatal		
1	37 Caesarean section	2270 g 46 cm	yes		-complete left cheilognatho-palatoschisis	-hyperpigmentation of scrotum -respiratory insufficiency
2	26 Caesarean section	965 g 29 cm		yes	-cleft of hard and soft palate -unilatelar cleft of lip	-infection
3	37 spont.	2260 g 45 cm	yes		-bilateral cheilognatho-palatoschisis -microphalmy	-hypoplasia of vermis cerebelli -interventricular septal defect of heart -suspicion for Patau syndrome -polydactylia, malformation of genitalia -respiratory insufficiency
4	34+2 Caesarean section	1970 g 43 cm		yes	-cleft of soft palate -coloboma of eyelid -microstomia, hypomimia -micrognathia	-deformation of upper extremities, -narrowing of hearing canal -bradycardia
5	41 spont.	3000 g 49 cm	yes		-bilateral cheilognatho-palatoschisis	-diabetes mellitus -respiratory insufficiency -feeding problems
6	35 Caesarean section	2040 g 45 cm		yes	-bilateral cheilognatho-palatoschisis	-tetralogy of Fallot -anemia -hypospadia -ventricular septal defect -respiratory insufficiency
7	39 Caesarean section	2760 g 49 cm		yes	-hypoplasia of musculus orbicularis oris and musculus depressor labii inferior -asymmetry of lower lip	-stenosis of aortic isthmus -hyperfixation of duodenum -omphalocele -foramen ovale appertum -postnatal hypotrophy
8	38 spont.	2130 g 44 cm	yes		-bilateral cheilognatho-palatoschisis -central protrusion of hard and soft palate of lip -microcephaly	-deformity of ear -ventricular septal defect -respiratory problems
9	41 spont.	2840 g 48 cm	yes		-bilateral cheilognatopalatoschisis -absent ophalmic bulbus -hypoplastic orbita -keratopathy, lagophalmus -intraretinal hemorrhages -hyperplastic iris -disgenesis of cornea -lack of lower palpebral	-oligohydramnion -hypoxic-ischemic encephalopathy -sideropenic anemia -chronic dyspepsia -respiratory insufficiency
10	38 spont.	2650 g 47 cm	yes		-left complete cheilognatho-palatoschisis -dacryoadenitis	-Down syndrome -hypotonic syndrome -feeding problems -interventricular septal defect
11	40 Caesarean section	2000 g 45 cm	yes		-medial cheilognatho-palatoschisis -one common nasal opening -microcephaly	-Patau syndrome -cyst in brain -polydactylia, syndactylia -malformation of anus -ductus arteriosus -respiratory problems
12	34 Cesarean section	2920 g 48 cm		yes	-left cheilognatho-palatoschisis -acute purulent conjunctivitis	-polydactylia -asymmetric genitals, agenesis of left kidney -cardiac arrhythmia
13	37 spont.	3050 g 48 cm	yes		-bilateral cheilognatho-palatoschisis -dysplasia of right part of maxilla -cleft of right eye	-prematurity
14	41 spont.	3470 g 51 cm	yes		-complete cheilognatho-palatos-chisis -protrusion, rotation of premaxilla	-interventricular septal defect -bradycardia -respiratory insufficiency

Abbreviations: spont. – spontaneous, g – grams, cm – centimetres, g. w. – gestational week

very useful (Martinez-Ten *et al.*, 2012). In only 9 patients in our group, diagnosis of complete cheilognathopalatoschisis was confirmed prenatally.

Clefts are typical findings in newborns with trisomies (Brucknerová, 2014). We confirmed chromosomal abnormality in one patient (trisomy 21; suspicion for Patau

syndrome which was not confirmed because parents did not agree with genetic investigation). Two premature newborns had mild degree of perinatal asphyxia and two term newborns had also mild degree of perinatal asphyxia. The worst postnatal complications associated with palatoschisis are breathing problems (Davies *et al.*, 2017). In our group of patients, 33 % had respiratory insufficiency without presence of congenital heart abnormality, 66 % congenital heart abnormality with respiratory insufficiency, and only 2 patients had feeding problems. Other complications were consequences of accompanied congenital abnormalities.

Prognosis of all children depends on the nature of the abnormality. Treatment and care for each child must be multidisciplinary (Brucknerova, 2014).

The lips are necessary for sucking and the palate plays an important role in forming sounds. Separately developed lips and palate cause the origin of different forms of clefts as they do not have a common origin. Detection of palatal cleft, mainly in the case of the cleft of the soft palate and uvula, without detailed investigation of the oral cavity is impossible (Jelinek *et al.,* 1983).

Up to the moment of operation, the patient is at risk of complications – frequent aspiration followed by respiratory insufficiency, feeding problems, hearing problems, frequent ear infections and speech difficulties. Safe lateral sleeping position is recommended in the majority of cases (Davies *et al.*, 2017).

Management is often centralized because of the need of multidisciplinary cooperation and coordination (gynecologist – possible prenatal diagnostics, neonatologist, geneticist, plastic surgeon, speech specialist, orthodontist, otorhinolaryngologist, and audiologist). Timing of surgical correction depends on the nature of the congenital abnormality. Long-term follow up is necessary. Surgeons do not only effectively repair the cleft, but have to restore the function of the palate for adequate speech (Kosowski *et al.*, 2012).

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