

Abstract

The presented thesis summarizes the results of research on craniofacial morphology in patients with facial cleft defects in relation to therapeutic approaches (Caganova et al., 2014; Dadáková et al., 2016; Hoffmannova et al., 2016; Hoffmannova et al., 2018; Moslerová et al., 2018). The effect of therapy in individuals with pathological growth disorders cannot be evaluated without detailed auxological studies of control subjects whose facial morphology, longitudinal changes, or manifestations of sexual dimorphism were evaluated upon similar methodology (Koudelová et al. 2015). Therefore, the thesis was conceived as a volume of six publications complemented with a general synthetic introduction into the area of study. Together, the thesis includes probands in a broad age spectrum from birth to 15 years with a total of 294 facial 3D scans, 36 tele-X-ray face images, 3D scans of 112 gypsum palate castings. The methods of geometric morphometry and multidimensional statistics prevail in the assessment.

The main clinical part of the thesis deals with the influence of two types of surgery on the facial growth and development of patients with cleft palate, namely secondary spongioplasty (SS) and neonatal cheiloplasty (NCH). Neonatal cheiloplasty (NCH) is the surgery whose effects were studied from several angles. NCH is a lip defect surgery performed during the first two weeks of life, most often between 1 and 7 days after birth. In two of our studies we deal with assessment of palate growth in children with complete unilateral cleft lip, jaw and palate (cUCLP) and a less severe defect of the bridge (UCLP+b) during the first ten months of life. In this period before the next surgery (palatoplasty) we can clearly identify any possible negative effects of NCH on the growth of the maxilla. The results showed that the palate in children after neonatal suture underwent similar growth changes regardless of the extent of the impairment, while palates in case of complete clefts were significantly more affected by the NCH than the palate in the individuals with a bridge. The largest growth in this period occurs at the anterior and posterior margins of both palate segments, with the maxilla in UCLP patients exhibiting similar growth tendencies as compared with data from healthy individuals. Our results suggest a very important lesson that neonatal suture of the lip during the first year of life itself does not limit the growth of the maxilla at the anterior ends and in the anteroposterior direction overall and during the observed period it does not lead to narrowing of the dentoalveolar arc in the space between the canines (Hoffmannova et al. 2016, Hoffmannova et al., 2018).

The impact of NCH on facial morphology of pre-school children with a cleft defect was evaluated based on the shape of the overall face surface. In patients with isolated cleft lip (UCL), unilateral complete cleft lip, jaw and palate (UCLP) and bilateral complete cleft lip, jaw and palate (BCLP) there was observed the development of face in two age categories and then compared with the corresponding age standard. In all the cleft defects, deviations of facial morphology, as compared to the standard, were the most evident in the nasal area and in the place of origin of the defect (*philtrum*), while in (UCLP) and (BCLP) there was also slightly hypoplastic buccal area. The BCLP individuals were the most severely affected and their deviations become only non-significantly more pronounced with age. The most important conclusion of the study is the finding that neonatal cheiloplasty does not have negative effect on the growth of the face between the 3rd and 5th year of life (Dadáková et al., 2016).

The follow-up study studied an extended set of the same patients whose facial asymmetry was observed, being a typical manifestation in patients primarily with unilateral orofacial clefts and is usually accentuated due to the surgical procedure. The results indicate that unilateral defects (UCL, UCLP) possess asymmetry especially in the primarily affected nasolabial area, while in UCLP patients the asymmetry affects also the more lateral facial region. It was unexpected to discover that BCLP patients, although having an upper lip defect on both sides, showed positive symmetry deviations, similar to UCL and UCLP, in the upper lip on the left. In other areas, BCLP's asymmetry varies from UCLP, but compared to unilateral defects the asymmetry was less pronounced and it may be considered as only an asymmetry of a control set. Apart from the buccal area, the asymmetry does not become more pronounced with age (Moslerová et al., 2018).

Secondary spongioplasty is an operation consisting in filling the upper jaw defect with small spongiouse grafts and is performed most commonly between the seventh and ninth year of age, depending on the emergence of permanent canine teeth. The main objective of the surgery is to supplement the missing bones of the upper alveolar arc and to enable the emergence of a permanent canine tooth in place of the original cleft defect. In our study we observed the effects of this therapy on the development in face between 10 and 15 years of age, which is highly critical age in the ontogenesis of the splanchnocranium of patients with orofacial clefts. The results reveal that the alveolus defect (SS) remedial method has a very positive impact on the formation of the patient's face. When compared with previous surgery type, the profile of

patients with SS was more convex, with more pronounced nose and less damaged vertical relationship between the two jaws (Cagáňová et al., 2014).

The main clinical part is complemented with an auxological study based on longitudinal observation of facial morphology in healthy individuals at the age of puberty spurt. Adolescence is very important, as concerns the study of cleft patient pathological development because it is this period when the insufficient growth in the middle part of the face and the deterioration of the intermaxillary relationships are described. The methodology, like in most previous studies, was based on the evaluation of variability and average form/shape of the face studied in virtual 3D facial surface models, using advanced methods of geometric morphometry. A study by Koudelová et al. (2015) provided an observation, very valuable from the clinical point of view, that between the 12th and 15th age no sexual dimorphism in the facial shape was proven after scaling to size. Sexual dimorphism in facial morphology was significantly different from the age of 14.