

ABSTRACT

Introduction: Orofacial clefts are one of the most common congenital craniofacial defects associated with serious health complications. The aim of any surgical intervention is to minimize these health problems in order to achieve the highest possible quality of life for patients. A surgical repair of the lip is the first approach, the timing of which varies between surgical centres. Due to current advanced medical techniques, this surgery can be performed immediately after birth (early neonatal cheiloplasty). This operation can lead to an improvement in the occlusion of the dentoalveolar arch, but on the other hand, it may have a negative effect on the size or shape of the dentoalveolar arch due to increased tissue tension after the procedure.

Objectives & design of the research: The main objective of this research is to provide a comprehensive evaluation of the effect of early neonatal cheiloplasty on the morphology and growth of the palate and face in patients with different types of orofacial clefts in comparison with normal growth patterns and symmetry in healthy probands. The present thesis is divided into two parts to achieve this objective. The first and core part of the thesis focuses on palatal and facial development in children with orofacial clefts after early neonatal cheiloplasty. The second and complementary part of the thesis deals with the normal development of the palate in healthy individuals and the development of directional asymmetry in relation to age and sex in a healthy population.

Materials & methods: This thesis consists of a summary of five publications (Jaklová et al., 2020; Kožejová Jaklová et al., 2021; Kožejová Jaklová et al., 2023a; Kožejová Jaklová et al., 2023b; Harnádková et al., 2023). These publications are based on the evaluation of 3D palatal models (n = 400) and 3D facial scans (n = 509) obtained longitudinally and transversely. The present research includes a wide range of probands, including patients with various orofacial clefts and healthy individuals of Czech nationality, ranging in age from birth to older adulthood (0 to 80 years). The methodology is based on the principles of geometric morphometrics and multivariate statistics and was complemented by methods of classic morphometrics.

Results: The results concerning patients with orofacial clefts in early childhood (0 up to 2 years of age) after early neonatal cheiloplasty are summarized in the first part of the thesis. Longitudinal morphometric analyses of dental models of patients with orofacial clefts after

early neonatal cheiloplasty show that during the first 12 months of life, the alveolar clefts narrowed due to unrestricted anterior palatal growth combined with the shaping effect of the suture. During the first 12 months of life, there was also no restriction of palatal growth posteriorly or in length, which was consistent with the growth patterns in the healthy population or in patients operated on at an average age of three months. The faces of patients with orofacial clefts were significantly affected by the presence of the cleft in the first two years of life, depending on the severity of the cleft. Patients manifested retrusion of the oronasal region and forehead, protrusion of the supraorbital and ocular regions, and anterior displacement of the chin compared to controls. There was no progression of deviations with increasing age; on the contrary, there was a slight improvement after the first year of life.

The results focusing on a healthy population from preschool age (6 years) to older adulthood (80 years) are presented in the second part of the thesis. The development of a healthy palate was non-linear in females, with a break in early puberty (between 10 and 12 years) and termination at 15 years, while in males the development of a healthy palate was consistent with a duration of at least 19 years. Sexual dimorphism of the healthy palate was evident from 15 years of age. Directional asymmetry manifested itself in a similar manner in the healthy population in both sexes and in each age category. The faces tended to form a slightly convex C-shape of the midline, resulting in a clockwise rotation of the upper face and a counterclockwise rotation of the lower face. Sex differences appeared up to the age of 40 years.

Conclusions: Comprehensive analysis of the entire 3D palatal and facial surface using geometric and classic morphometrics has confirmed that patients with orofacial clefts in early childhood after early neonatal cheiloplasty show growth trends comparable to the healthy population and patients operated on with standard surgical protocol at an average of three months. The results of the present thesis can be applied in clinical practice as part of the revision of surgical procedures, diagnosis, and the determination of effective and individualized therapy.