



Methods of cleft lip and palate treatment over the centuries – a historical view

Metody leczenia rozszczepów podniebienia pierwotnego i wtórnego na przestrzeni wieków – rys historyczny

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ABSTRACT

INTRODUCTION: Cleft palate is one of the most common congenital defects, associated with many problems including cosmetic and dental abnormalities, as well as speech, suction, chewing, swallowing, hearing and facial growth difficulties.

AIM OF THE STUDY: To review different attempts and methods of cleft palate treatment, such as using obturators or surgical treatment.

CONCLUSIONS: Cleft palate has been known for a long time and its treatment has been a considerable challenge for clinicians throughout the history of dentistry. The contemporary system of treatment of cleft palate is complex and multidisciplinary.

KEY WORDS

cleft palate, cleft surgery, history of dentistry, obturator

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STRESZCZENIE

WPROWADZENIE: Rozszczep podniebienia jest jedną z najczęstszych wad rozwojowych twarzoczaszki, polegającą na braku ciągłości anatomicznej i niedorozwoju tej struktury. Powoduje ponadto liczne zaburzenia czynnościowe (oddychania, ssania, połykania, żucia i mowy) oraz sprzyja infekcjom dróg oddechowych i ucha środkowego.

CEL PRACY: Przedstawienie na podstawie piśmiennictwa różnych metod leczenia rozszczepu podniebienia, zarówno leczenia protetycznego przy zastosowaniu obturatorów, jak i leczenia chirurgicznego.

PODSUMOWANIE: Rozszczep podniebienia, podobnie jak inne choroby, prawdopodobnie znany był ludzkości od początku jej istnienia. Na przestrzeni wieków podejmowano wiele prób wyleczenia tej wady lub zniwelowania efektów ubocznych. Obecnie obowiązuje wielospecjalistyczny model leczenia rozszczepu podniebienia.

SŁOWA KLUCZOWE

rozszczep podniebienia, leczenie chirurgiczne rozszczepu, historia stomatologii, obturator

Cleft palate is one of the most common craniofacial abnormalities that manifests itself in a lack of anatomical continuity and underdevelopment of this structure. It also leads to numerous i.e. breathing, suction, swallowing, chewing and speech dysfunctions, as well as contributes to upper tract respiratory infections and middle ear infections.

Cleft palate, like other diseases, has probably been known since the beginning of humankind. Nonetheless, in the historic record no information was found on its treatment. Ancient people's attitude to disabled children might have influenced it, i.e. the fact that in some cultures such children were killed just after birth. Another factor was the high mortality rate among newborns with cleft palate caused by nutrition and breathing disorders. The treatment of cauterization applied in the case of palate injuries probably as early as in the times of *Celsus* in the 1st century or the golden age of medieval Arab culture might have been a method of cleft palate treatment [1,2]. The first attempts at prosthetic treatment date back to the 16th century and surgical treatment was initiated no earlier than the 19th century.

Prosthetic treatment of congenital hard and soft palate defects

The first prosthetic applied to separate the oral cavity from the nasal cavity with cleft palate was a tool called an obturator. It provided slight improvement in speech, breathing, chewing and swallowing. An obturator was used both in the case of congenital cleft palate, as well as acquired injuries or diseases.

Franz Renner (1510–1577), a Nuremberg doctor, was one of the first ones to describe obturators. He constructed a leather obturator as early as 1556. He used pieces of leather, ivory, gold or silver to close the split which was the result of syphilis. However, his obturator was quite heavy. Besides, as *Renner* himself

admitted, its installation was painful [3,4,5]. *Amatus Lusitanus* (1511–1561), a Venetian doctor, had a similar idea. In 1560 he was probably the first to describe in medical literature a real palate obturator made of a gold plate adjusted to the gap with a sponge [6].

In 1564 the Italian doctor *Alessandro Trojano Petronius* (? –1585) applied cotton wool, cotton thread and wax to close palatal fistula and improve pronunciation. In his view, the patient's speech may deteriorate to such a degree as to become incomprehensible after either removing or falling out of the palatine bone as a result of gangrene. In 1565 he designed a concave gold plate that would fit the palate. It was made by a 'professional artist' [4,7].

Ambroise Paré (1509?–1590), a French surgeon, criticised *Petronius*'s obturator by claiming it did not fulfil its role. This is the reason why he constructed his own that consisted of a metal (gold or silver) plate that would close the split. The plate was as thick as a thaler, the shape of a bowl and slightly bigger than the gap. Two bent blades (wings) were fixed to the plate on the inside, supported by a sponge or cotton wool, which due to mucus from the nasal cavity swelled, holding the obturator in a proper position. Still, since some food leftovers gathered in the sponge or cotton wool, it resulted in an unpleasant smell from the patient's mouth and in consequence it had to be changed frequently. Another disadvantage of the obturator was that as a result of cotton wool or sponge swelling, it made the gap bigger. Based on his observations, *Paré* constructed another obturator in the shape of cufflinks and for the first time used the term obturator from Latin *obturatio* meaning to clog, obturate. The device consisted of two blades: a smaller oval one that was fixed at the base of the skull and could be turned by means of a screw or pin, the second one was put on the oral cavity side; it was convex and bigger than the cavity perforation thus covering it. The smaller blade had to be put into the palatine hole/fistula at the place



with the biggest diameter and the blade screwed in place by means of a screw or pin where the perforation was of the smallest diameter. Unfortunately, this obturator also contributed to slow enlarging of the gap [4,5,7].

Another model of an obturator was introduced by *Jacques Guillemain* (1550–1613) 50 years after *Ambroise Paré*. Yet, the obturator did not differ significantly from *Paré*'s, as well as another one that consisted of a gold plate fixed on a sponge, presented in 1756 by German surgeon *Lorenz Heister* (1683–1758) [7].

Pierre Fauchard (1678–1761), the author of "Le Chirurgien dentiste on traite des dents" published in 1728, which was a milestone in dentistry [8], observing *Paré*'s obturators concluded that they fall out or are dislocated so easily that their use makes no sense, is troublesome and uncomfortable. *Fauchard* provided a manual for making 5 kinds of obturators in the 2nd volume. The first two projects were destined for patients with teeth, the 3rd and the 5th one for those without. The first two obturators were made of metal, whereas the 3rd and 5th were made from a combination of metal and ivory to which artificial teeth in place of the missing ones were attached. *Fauchard* used human teeth, as well as those of a hippopotamus, an ox, walrus and elephant. The first three kinds of obturators, as well as the 5th one were based on the same retentive method. *Fauchard* used 'a small gold roller in the form of a cross that rested on the sides of the cavity.' The above manner was inspired by his hobby, i.e. watch making. The way the obturators were fixed by *Fauchard* did not differ, nonetheless, from the obturators of his predecessors. The fourth obturator was designed for patients without an upper incisor and with a defect with regard to the nose base. This obturator was made from ivory shaped in a way that it had a 'hill' that was then prolonged to reach the defect where the sponge was attached. *Fauchard*'s obturators were in those days a significant progress. Still, the way they looked, as well the primitive look of the artificial teeth attached to them made them rather looked down upon. Besides, they were too complicated either to put in or take out of the mouth. Furthermore, they turned out to be incompatible with oral cavity tissue. *Betelman* and *Bynin* concluded that *Fauchard*'s obturators were often the cause of decubitus, mucous membrane deterioration, which contributed to gap widening and slowed the healing process [3,4,5,7].

In 1756 the French dentist *Etienne Bourdet* (1722–?) gave a presentation in which he criticized *Fauchard*'s prosthetic [9]. Based on long-term experience, he concluded that the palate cavity became smaller in time. This is why he changed the way the obturator had been fixed to date, advising the construction of a metal palatine plate that would cover the whole palate and that would be fixed on both sides of the patient's own

teeth by means of silk or gold threads. In the case of a lack of teeth, the metal plate was fixed by means of special springs.

In 1820 *Christophe Francois Delabarre* (around 1780–1862) [10] made the first attempt to apply functional therapy to improve the obturator. In his work entitled 'On dental technology' he reported that the silk threads that supported the obturator earlier were replaced with metal braces. Besides, he constructed an obturator which was not applied solely on the hard palate, but on soft tissues as well. It was made of soft caoutchouc. In this way *Delabarre* became the first constructor of an obturator that was largely defective, but it was the first one to have a 'movable' part.

In 1823 *James Herbert Snell* from London made an obturator which was applied in the case of congenital cleft soft palate. The prosthetic was fixed to molars with the use of gold wire and consisted of a gold plate which was welded on the back part with a plate made of soft caoutchouc with the aim of transforming the hard palate into a soft one. In 1828 *Snell* published the book 'Obturators' and modified his own device by enabling movement of its back part [11].

In 1841 *J.M. Alexis Schange*, a French dentist modified *Delabarre*'s prosthetic and for the first time applied a retention model from tire rubber, to make an obturator with a so-called 'mechanical soft palate' two years later [5].

C.H. Stern [10], an American doctor who had cleft palate himself, after three unsuccessful operations attempted prosthetic treatment. Despite having little to do with dental technique, he decided to make an obturator himself. Having experienced a few failures, he made an impression of his cleft palate by means of wax properly fixed on a bent stick. He then made a wooden model, on which he prepared and vulcanized his caoutchouc prosthetic. In 1845 he demonstrated his idea in Paris and London, and later described it in 'The Lancet'. *Stern*'s obturator was a breakthrough in the history and development of cleft soft palate [5,6].

Around 1859 *Norman W. Kingsley* [12], a New York professor, made an obturator entirely from caoutchouc. The prosthetic consisted of two parts: a plate fixed on two braces that covered the hard palate and another one which covered the front part of the soft palate split. The anterior part of the soft palate consisted of two movable plates, which thanks to a special connection separated the oral cavity from the nasal cavity during pharyngeal reflex. Thanks to the fact the soft palate part was connected with the palate plate by means of a gold chain, better movement capacity than in other obturators was obtained. *Kingsley*'s achievement in prosthetic cleft palate treatment was the use of soft caoutchouc to make an artificial palate. The use of 'an artificial tongue' which was also made of soft caoutchouc was another novelty.



Calvin S. Case, a well-known American orthopaedist, offered an original obturator similar to *Kingsley's* prosthetic and called it a 'swimming obturator'. It was built of a thin plate the size of the cavity and its construction was not very complex so it could be applied in cleft palates. Nonetheless, *Kingsley's* and *Case's* prosthetics had a significant defect, i.e. after a few months of use the soft caoutchouc toughened and could not be used any longer [5].

Claude Martin, having made a few attempts, managed to make an obturator in one piece which filled the palate split completely and separated the oral from the nasal cavity [13].

H.P. Pickerill suggested a new method of cleft palate treatment which was based on a two-stage prosthetic and surgical treatment. The first surgical part was based on fixing the so-called tissue bridge. The second one took place after the wound healed entirely and consisted in covering the split with a plate fixed by a protruding *Pickerill's* lever [14].

In 1863 *Gustav Passavant*, a well-known surgeon from Frankfurt on Mein, established that during swallowing the throat sphincter is pushed up, which results in closure of the entrance to the pharyngonasal cavity [15]. This fact played a significant role in the development of cleft palate treatment.

In 1864, based on *Passavant's* observations, *Wilhelm Fredrich Süerson*, a Berlin dentist, made the first obturator taking into account the anatomical and functional conditions in the patient's oral cavity [10]. In 1866 *Süerson* made a speech at the meeting of the German Dental Association in Hamburg where he described in detail the construction and functioning of obturators. He presented his viewpoint that due to the fact that the obturators to date did not take into account the existing anatomical and physiological conditions, it was impossible to obtain fully satisfactory results in treatment. Besides, based on a 20-year-long observation of 365 patients treated prosthetically with obturators, he noticed that only 'functional' obturators could replace the functions of the soft palate and contribute to improvement in pronunciation and swallowing. *Süerson's* was built of two parts: the prosthetic part fixed on the hard palate and a block that fulfilled the role of the soft palate and was placed in the crevice of the cleft soft palate. The block 2–3 cm long and 4 cm wide protruded in the back part of the palate. With the aim of obtaining a precise functional impression on swallowing movements and pronouncing 'm' and 'n' consonants, *Süerson* covered the block with black gutta-percha and introduced it to the oral cavity. The next step was to form all the gap surfaces of the cleft palate tissue and replace gutta-percha with caoutchouc. *Süerson's* obturator had a few characteristic traits. One of them was the fact that the back part of the obturator, functionally shaped, adhered to *Passavant's* roller during swallowing and speaking and in

this way closed the entrance to the nasal cavity. Additionally, the obturator surface, which adhered to the nasal cavity, did not touch the lower nasal shells and did not hinder breathing through the nose with the person's mouth shut. In addition, both when at rest and under action of the sphincter muscles, the lateral surfaces of the obturator were in contact with palatal plates. Despite *Süerson's* obturators being perceived as one of the best and most similar to the functional conditions in the oral cavity, they also had downsides. Namely, they were thick and heavy, which caused decubitus, mucous membrane irritation and other disorders [2,4,16,17,18].

Grohnwald modified *Süerson's* obturator by diminishing its size, which resulted in reducing the significant cleft soft palate crevice [16]. On the other hand, *Hartung* managed to reduce the weight of the obturator and provided the possibility of draining mucous from the nose thanks to a hollow in the shape of a channel on the nasal surface of the prosthetic. *Ludwig Warnekros* proved that the back part of the obturator which fills the crevice of the soft palate could be reduced without an influence on swallowing or pronunciation. He made numerous modifications of obturators both for adults and children [16,17].

In the 19th and at the beginning of the 20th century, surgical treatment of cleft palate progressed considerably. However, contrary to this tendency many doctors still used caoutchouc obturators or metal ones in treating cleft palates. One of them was *Jung* who made an obturator of black gutta-percha in 1889 that was joined with the denture by means of special wires placed in metal tubes. *Hahn* (1894) and *Wellauer's* (1897) obturators, on the other hand, caused constant movement as constant muscle massage to the soft palate and throat led to gradual reduction of the cavity crevice, which after some time turned out to be redundant [17, 19]. *Fröschels* and *Chalit* made an obturator called a Meatobturator. Its back part was positioned vertically and closed the exit of the nasal track on the throat side, not covering the soft palate cavity at the same time [17].

In 1882 *O. Schiltsky* applied for the first time a specially constructed caoutchouc obturator, hollow inside, in order to close cleft soft palate. Thanks to joining the obturator with the palatine plate by means of a special spring, the back part of the obturator was constantly raised due to the pharyngeal reflex. The joint led to gradual diminishing of the crevice, besides it caused improvement in pronunciation. Another advantage was the fact that it did not irritate the mucous membrane and was very light. The obturator could be applied only in persons who had undergone surgery first and it was not free of faults such as spring breakage, soft caoutchouc toughening, as well as the obturator absorbing mucous [19].



Brugger's obturator was similar to *Schilsky*'s obturator. The only difference was that it was made of cork mass covered with a soft caoutchouc layer. Thanks to this it was significantly lighter and the constant resistance positively affected the soft palate muscles [20]. In a similar way *Otto Grunert* constructed his obturator. Through the use of a specific way of joining plates, it was possible to easily separate them from the obturator [16].

Brandt's obturator was dedicated both to patients with cleft palate having been operated or not operated. This obturator consisted of a rubber bladder fulfilled with air by means of a pump. Thanks to the fact the oral cavity was hermetically closed and separated from the nasal cavity, the oral cavity functions were largely facilitated. The drawback of the appliance, however, was the fact that it had to be frequently repaired, which resulted from the balloon's short life. *G. Staegemann*'s obturator, made from soft acrylate, *D. M. Watt*'s obturator, made from flexible latex, as well as *Dietrich Wolf*'s obturator, all may be classified in the same group of obturators [16,17,19].

Prosthetic treatment of cleft palate was initiated in Poland in 1816 by the surgeon *Rafał Jerzy Czerwiakowski* [17]. In the middle of the 19th century a few works on the application of obturators made from caoutchouc and acrylate were published. An article on the prosthetic treatment of cleft palates by *J. Kaspro-wicz* appeared in "Przegląd Lekarski" ("Medical Review") in 1877 [21].

A significant influence on the development of prosthetic cleft hard and soft palates can be attributed to *Władysław Zieliński*, who devoted two works to this problem. In 1879, *Zieliński*'s first obturator, based on *Süerson*'s principles of prosthetic construction, was described in the "Medical Journal" [22]. *Zieliński* concluded his observations and experience from an over 28-year practice in this field in his second work "On Prosthetic Treatment of Cleft Palate", published in 1901. Additionally, *Władysław Zieliński* was the first to emphasize oral cavity sanitation before prosthetic treatment of cleft palate [23].

In the 1920s, *T. Szaniawski*, *L. Goldberg-Górski* and *A. Raczyński* published articles on cleft palate prosthetic treatment in "Dental Review" [16,17,24].

Antoni Cieszyński constructed obturators for patients with cleft hard and soft palate based on his predecessors' experience. The obturator for patients with cleft soft palate consisted of two parts: a palate plate and a movable obturator for the cavity in the soft palate. Both parts were connected by means of a plate and fixed with a pin, whereas obturators applied in complete cleft palates were constructed in one block. Besides, *Cieszyński* applied an innovative method of making an impression to form full obturators [16].

Surgical treatment of cleft palate

In 1764 A.A. *Velpeau* informed in his work "Médecine opératoire" that *Le Monnier* had performed the first operation on cleft palate. Surgical cleft palate treatment was also undertaken by *Carl Ferdinand Graefe*, who in 1816 was the first one to describe this kind of surgery. The operation consisted in bleeding the edge of the split and then stitching membrane in the place of the crevice [25].

Besides, in the first half of the 19th century several famous surgeons prepared and described numerous surgical methods. *P. Roux* (1819), *J. Diffenbach* (1826), *W. Krimer* (1824), *J. C. Warren* (1824) and *W. Fergusson* (1844) were among them [1,2,26,27]. Despite their significant contribution to the development of this branch of surgery and applying interesting and sometimes original solutions, their surgical methods are now only of historical value. In 1828 *Johann F. Diffenbach* as the first performed surgical closing of cleft hard and soft palate and described the method of secondary cleft palate treatment by using side cuts on the edge of the palatine processes and alveolar ridges. He cut off the alveolar ridges and relocated them together with the mucous membrane to the median line in order to join the two split parts of the palate without tension [25,28]. Still, the history of contemporary operational methods dates back to *Langenbeck*'s times. *Bernhard von Langenbeck* (1861) was the first to discuss the possibility of performing extensive exfoliation of the mucoperiosteal flap. Creating these flaps is one of the most fundamental elements of all contemporary surgical methods. *Langenbeck*'s operation consisted in putting palatine flaps in motion by side decompression surgery and then stitching the bleeding edges of the crevice. *Langenbeck*'s original method did not give the possibility of full closure of the cleft palate crevice and its retraction [1,2,29,30,31]. However, *Brophy* (1893), in order to reduce the palate crevice, put bone ridges of separate parts by means of wires and then stitched the soft parts of the cleft palate [30]. In order to reduce muscle tension of the soft palate and make it easier for the split parts of the palate to come closer, *Billroth* (1880) suggested breaking the hamulus of the sphenoid bone. The broken hamulus together with the adherent muscles had to be relocated to the centre [32].

For many years the applied operational methods for cleft palate did not give satisfactory results in anatomical reconstruction or in terms of improvement in speech. The large number of failures in the performed operations made some surgeons search for desperate methods, at the same time having drastic ideas. *Victor Veau* mentions them in his monography. He describes among others the case of removing the index finger of



the left hand in a 16-year-old girl to use it as material for closing the cleft palate crevice. Another doctor used the lateral arm flap and then pulled it through an opening in the cheek towards the crevice to perform plastic surgery on it. *Veau* also describes the use of a pedicle flap, which was taken from the patient's abdomen and introduced to the oral cavity through a hole in its bottom and then used to fill the cleft palate. The personal data of the doctors of these crippling, macabre and sometimes even fatal operations were left out since *Veau* assumed they were shameful. Another interesting fact is that such surgeries were conducted after 1920 and took place predominantly in clinics [30].

Victor Veau, a Paris pediatric surgeon is regarded as the father of cleft palate surgeries in the 20th century. In his book from 1938 entitled “*Bec de lièvre*”, today considered as a medical canon, he presents the functional concepts of surgeries on patients with cleft lips, cleft palate or cleft gingival ridges. He was one of the first surgeons to conclude that to obtain good effects in the treatment of cleft palate, muscle reconstruction of this hugely important and unique dynamic tissue in the vicinity of the cleft palate is necessary. He described some general rules of his method. One of them consisted in reproducing continuity of the muscles through their activation, relocation to the median line and then joining the muscles that were relocated externally. Moreover, he concluded that osteotomy should not be applied in modern surgery as it leads to deformation of the face. The way he stitched the palate muscles did not only reduce muscle tension at the edge of the wound, but also ensured support for the thread on the flexible but little elastic and dynamic muscle tissue. After the continuity of the muscles was reconstructed, the stitches making the edges of the mucous membrane come closer were not stretched as the whole tension weight was transferred to the stitches of the approximating muscles. Only stitching muscles enabled full motion within soft palate to be retrieved and through this was improvement in speech possible. In the case of leaving the cleft palate in the perimeter of the relocated muscles and only stitching the mucous membrane of the oral cavity, such progress in treatment became impossible to reach. *Veau* expressed the opinion that the basic rule for each plastic surgery success is to lift any kind of tension from the wound edges. Besides, he claimed that in each case of cleft palate there is ample material to carry out plastic surgery – the thing is to know how to find it, get it in motion and retrieve it. In 1931 *Veau* prepared his method with the use of a pedicle flap with palatine tissues applied in closing wider cleft palates [1,29,31]. In 1926 *Limberg* worked out his own operational procedure which he called “radical uranoplasty” [29]. A few years later (1933) *Dorrance* described the surgical operation which he called “push back”. Initially

this method was applied in the case of congenital short palate and then he used this procedure in all types of cleft palate treatment [33,34].

Wardill (1937) introduced a new method of cleft palate surgery [35]. This technique was then modified first by *Kilner* [36] and then by *Peet*, who described the surgical procedure in detail [37]. This operation is known as V–Y surgery, i.e. methods with three or four flaps or as *Wardill–Kilner*'s method, but *Peet* called it the Oxford technology of cleft palate surgery.

A new trend in surgical cleft palate treatment was introduced by *Hermann Schweckendiek* in 1944. The key rule is to apply the primary plastics of the soft palate as a separate method of operational treatment. Even though *Passavant* and *Billroth* created the concept of two-stage surgical treatment of cleft palate much earlier, still it is *Hermann Schweckendiek* and *Wolfram Schweckendiek*'s merit having developed this method in detail, as well as providing the grounds for its application [29,38]. *Schweckendiek* suggested a single early operation on cleft soft palate and the lip around the 4th or 6th month of life. He put off in time, however, cleft hard palate closure until the 12th–15th year of life. He suggested two-stage, cleft palate surgery enabling correct jaw growth, as well as correct pronunciation [31].

In 1978 during the South-Eastern Congress of Plastic Surgeons' Association, Leonard T. Furlow Jr. presented an alternative Z-plasty of the palate. Thanks to this method reconstruction of the musculus levator ring and palate lengthening are possible [39,40].

An alternative solution in cleft palate treatment was proposed by *Guerrero-Santos* and *Altamirano* in 1966 [41]. This method used tongue flaps to close cleft palate during reconstruction processes.

A milestone in cleft palate treatment was the introduction by Scottish orthodontist *Kerr McNeil* (1950) of early orthodontist treatment [42]. Further development of this method (1957–1967) can be attributed to an orthodontist from Zurich, *Rudolf Hot* and his wife, paediatrician *Margrit Holtz* [1].

Ludwik Bierkowski (1801–1885), a professor of Cracow Surgical Clinics also undertook cleft palate treatment. He conducted 128 operations, besides he used tools he made himself [4].

Janusz Bardach in 1967 described the first two-flap palatoplasty. This method is a modification of von *Langenbeck*'s technique's, in which a cut is made along the ridge of the cleft palate and the alveolar process. The original method may be applied only in the case of a narrow cleft palate crevice [29,43,44].

Starting in 1954, attempts at pre-surgical orthodontic treatment in children with cleft lip and palate were made by applying among others *McNeil*'s method. Furthermore, in the 1950s health centres were opened whose aim was to treat patients with malformations. One of them is the Malformations Clinic at the De-



partment of Orthodontics of the Medical University of Silesia in Zabrze, set up in 1956 [45,46].

Current standards in cleft palate treatment

Treating children with cleft palate has lasted for more than a dozen years. For a few dozen years it has been thought that aesthetic and functional disorders being the result of cleft palate require team therapy. The following specialists are part of the team treating cleft palate: surgeon, orthodontist, otorhinolaryngologist, paediatrician, pedodontist, phoniatrist, as well as a speech therapist, paediatric neurologist and a psychologist.

Treating a child starts straight after birth. The most advantageous period for the first visit in the centre in the case of cleft palate is the 3rd week of the child's life. In this period, an individual vestibular-palatal

plate is made. The palate is usually reconstructed between the 18th and 24th month in one step. During the follow-up visit 6 months after the palate operation, the child is examined by a phoniatrist and speech therapist who plan lessons that improve speech and suggest logopedic exercises. A small group of children requires another operation due to residual holes or velopharyngeal insufficiency resulting from shortening or limited moveability of the soft palate. Orthodontic treatment lasts till 16–18 years of age and is aimed at preventing maxilla occlusive disturbances during intensive face development. Some children undergoing cleft surgery do not require orthodontic treatment. Some children undergoing cleft palate surgery do not require orthodontic treatment. Most patients use either mobile or permanent dental braces [45,47,48,49].

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