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ORTHODONTIC TREATMENT OF PATIENTS WITH A CLEFT LIP AND PALATE – STANDARD PROCEDURES AT THE WARSAW INSTITUTE OF MOTHER AND CHILD

LECZENIE ORTODONTYCZNE PACJENTÓW Z ROZSZCZPEM WARGI I PODNIEBIENIA – STANDARDY POSTĘPOWANIA STOSOWANE W IMiD

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Abstract

Based on many years of multidisciplinary research relating to children and adolescents with a cleft lip and palate who had undergone one-step surgery at the Warsaw Institute of Mother and Child (IMC), orthodontic treatment standards have been developed for this group. IMC standard orthodontic assessment is conducted in children at the ages of 5, 10 and 15. This assessment involves a clinical examination, preparing diagnostic models, photographic documentation, as well as radiographic examination including a pantomogram, a lateral cephalometric radiograph and, where appropriate, also computed tomography. The treatment is conducted as part of the Programme of Orthodontic Care for Children with Congenital Craniofacial Disorders, and it lasts from a child's first appointment at the IMC till the completion of orthodontic treatment at the age of 18.

Key words: cleft lip and palate, orthodontic treatment, standard procedures, IMC

Streszczenie

Na podstawie wieloletnich multidyscyplinarnych badań własnych dotyczących dzieci z rozszczepem wargi i podniebienia operowanych w Instytucie Matki i Dziecka (IMiD) metodą jednoetapową opracowano standardy leczenia ortodontycznego tej grupy dzieci i młodzieży. W IMiD standardowo przeprowadza się bilans ortodontyczny u dziecka w wieku 5, 10 i 15 lat. Bilans ten obejmuje badanie kliniczne, wykonanie modeli diagnostycznych, prowadzenie dokumentacji fotograficznej, badania radiologiczne: pantomogram oraz zdjęcie boczne głowy w zwarciu zębów wraz z analizą cefalometryczną, a w uzasadnionych przypadkach poszerzoną o tomografię komputerową.

Leczenie realizowane jest w ramach Programu Ortodontycznej Opieki Nad Dziećmi z Wrodzonymi Wadami Części Twarzowej Czaszki i obejmuje okres od chwili pierwszej wizyty dziecka w IMiD do pełnego wyleczenia ortodontycznego (18 r.ż.)

Słowa kluczowe: leczenie ortodontyczne, rozszczep wargi i podniebienia, standardy IMiD

AIMS

The aim of this paper is to present the standards of orthodontic treatment developed at the Institute of Mother and Child for children and adolescents with a cleft lip and palate, as well as their modifications introduced on the basis of long-term experience.

MATERIAL AND METHODS

The Institute of Mother and Child in Warsaw (IMC) has treated patients with a cleft lip and palate for a number of decades and has over 9100 medical records on file. Because of its location and proximity to other specialist centres and clinics, the Orthodontic Clinic provides comprehensive counselling and treatment for children with a cleft lip and palate along with their families (1, 2, 3). Currently, in accordance with its contract with the National Health Fund, the Clinic has on average 500 patients a month. In 2012 there were a total of 6000 appointments, which included 447 new patients, with 7000 medical procedures being performed.

The interdisciplinary treatment of patients with a cleft lip and palate was implemented at the IMC in the 1960s. Today, the orthodontic treatment of children with a cleft lip and palate begins from the first appointment and continues until the treatment is completed, namely when correct occlusal and craniofacial conditions are obtained. This often happens after the growth stage is completed, thus marking the end of active orthodontic treatment.

The standards of care in orthodontic treatment involve five stages:

- Orthodontic care before and after primary one-stage surgery,
- Orthodontic treatment during the period of primary dentition,
- Orthodontic treatment during the period of mixed dentition,
- Orthodontic treatment during the period of permanent dentition,
- Multidisciplinary treatment after the completion of growth.

Orthodontic care before and after primary one-stage surgery

During the first visit to the IMC, a team of surgeons and orthodontists, together with a speech therapist, examine the child in order to decide on a treatment plan. Infants with a cleft lip and palate in most cases experience problems, as their sucking function is impaired. This observation has also been made by many other authors (4, 5). In the 1960s the treatment at the IMC involved McNeil's palatal plates, the purpose of which was to facilitate feeding during the pre-operative period and to promote a better adjustment of the two segments of the jaw (6).

Views regarding the techniques employed during primary surgical procedures at the IMC have evolved over the years. A one-step technique, where the lip and palate fissure is closed when the child is 6 or 7 months old, was introduced by Zofia Dudkiewicz 30 years ago and has since become the principal surgical technique in

the treatment of cleft lip and palate (7). The orthodontic treatment procedures have evolved accordingly. Pre-operative treatment at the IMC no longer includes the use of a McNeil plate. The effects of using this plate are controversial. Some researchers have argued that such therapy is pointless (8, 9, 10). Instead, in the case of a cleft palate, the parents are advised to feed the baby using a special wide teat which covers the fissure (Fig. 1). An isolated cleft lip does not preclude breastfeeding and the mothers are encouraged to use this feeding method (Fig. 2).

After the primary procedure for the simultaneous closing of the cleft lip and palate, when clinical examination during the eruption of deciduous teeth reveals reverse occlusion in individual teeth, we recommend massage to help change the position of the incorrectly positioned teeth, as well as a course of exercises to strengthen the orbicularis oris muscle in case of hypotonia.

Early orthodontic treatment also includes providing information relating to diet and oral hygiene, because in children with a cleft lip and palate the risk of dental caries is greater. This is also consistent with the findings of other researchers (11).

Orthodontic treatment during the period of primary dentition

The aim of orthodontic treatment for children with cleft primary and secondary palates during the period of full primary dentition is to achieve a symmetrical positioning of the teeth in the maxilla, which is connected with achieving an optimum shape of the maxillary alveolar process. Prior to the procedure of early primary autogenous

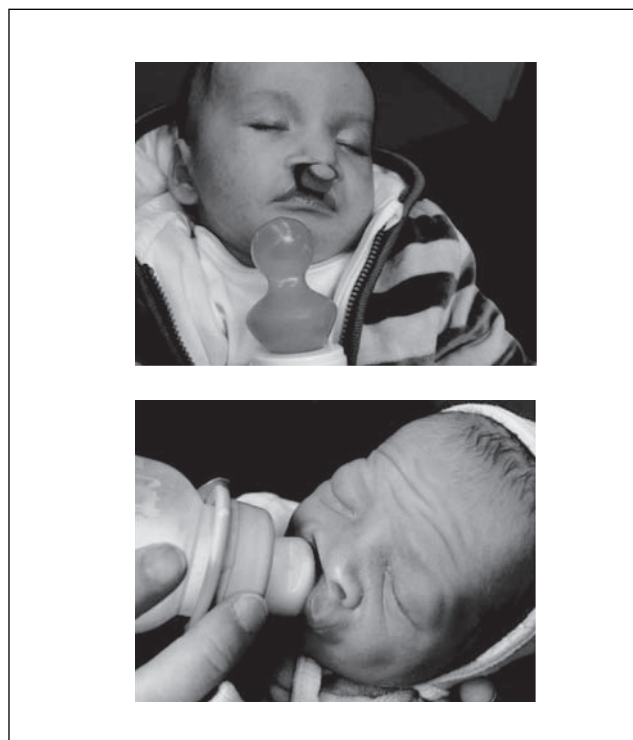


Fig. 1. Feeding with the use of a special wide teat.

Ryc. 1. Karmienie butelką z użyciem szerokiego smoczka.



Fig. 2. Patient with an isolated cleft lip during breast-feeding.

Ryc. 2. Pacjent z rozszczepem wargi i wyrostka zębodołowego karmiony piersią.

bone grafting into the alveolar process, no orthodontic treatment with removable appliances is implemented to eliminate crossbite. However, when bone has been grafted into the maxillary alveolar process, which typically happens when the child is 2-3 years old, and then about 3-4 months after surgery, the patients begin a course of treatment with the use of removable appliances. The patients selected for active orthodontic treatment are those who are most likely to cooperate well. The length, width and

symmetry of the maxilla are analysed on plaster models, and the track of tooth movement is determined. If the maxilla is asymmetrical, further care during the stage of primary dentition involves obtaining a symmetrical positioning of the teeth in the dental arch (Fig. 3a-d).

The purpose of this procedure is to create favourable conditions for future symmetrical maxillary growth. At the IMC it is accepted that such treatment should begin before the age of 6, which is consistent with the recommendations of other authors (12). Where justified, in cases when good cooperation can be assumed, fixed appliances can also be used in primary dentition (Fig. 4). Our own experience shows that obtaining correct occlusion is possible after only 3 months of treatment with the use of fixed appliances, which would be very difficult to achieve when using removable appliances. However, our clinical observations indicate that after an early bone graft, the alveolar process responds to treatment with either a removable appliance or a fixed appliance (Fig. 3 a-d. and Fig. 4).

Reducing the cusps of milk teeth is not a standard procedure prior to introducing an orthodontic appliance. It is performed only after crossbite has been eliminated. The aim of this procedure is to prevent premature occlusal contacts and to create appropriate conditions for a symmetrical range of lateral movement by the mandible.

Orthodontic treatment during the period of mixed dentition

The aim of orthodontic treatment during the period of mixed dentition is to create space for permanent teeth during the change of dentition as well as creating favourable conditions for the development of the maxilla in three spatial dimensions. When the disorders are not very severe, removable appliances are used. In more severe cases, where there is a significant reduction in the transverse dimension, fixed thick-wire appliances such as Expander are recommended. When there is a deficit in the antero-posterior dimension, thick-wire appliances are used in combination with a Delaire or Petite type face

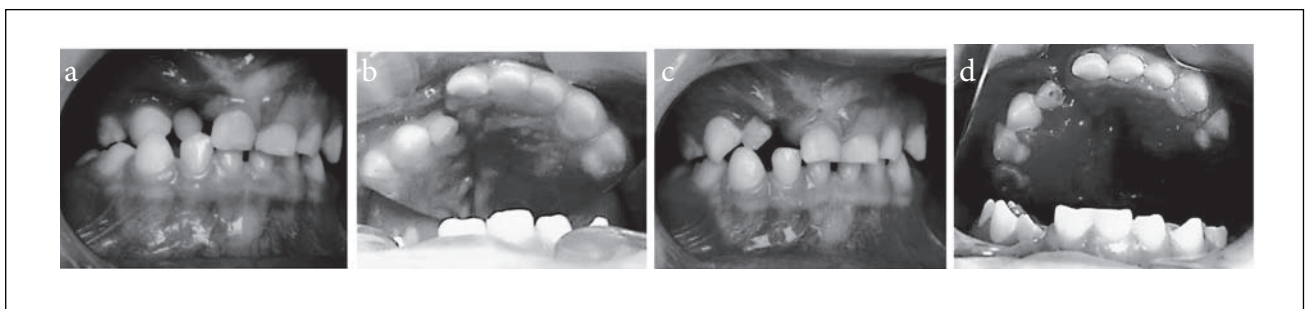


Fig. 3 a-d. Patient 4 months after bone grafting and before orthodontic treatment, a – cross bite on the right side, b – asymmetry of maxillary dental arch; c, d – 10 months after orthodontic treatment with removable appliance, improvement of maxillary arch.

Ryc. 3 a-d. Pacjent 4 miesiące po przeszczepie kości do wyrostka zębodołowego i przed rozpoczęciem leczenia ortodontycznego, a – zgryz krzyżowy częściowy boczny prawostronny, b – asymetryczny kształtu szczęki; c, d – stan po 10 miesiącach leczenia ortodontycznego z użyciem aparatu ortodontycznego zdejmowanego, wyraźna poprawa w ukształtowaniu szczęki.

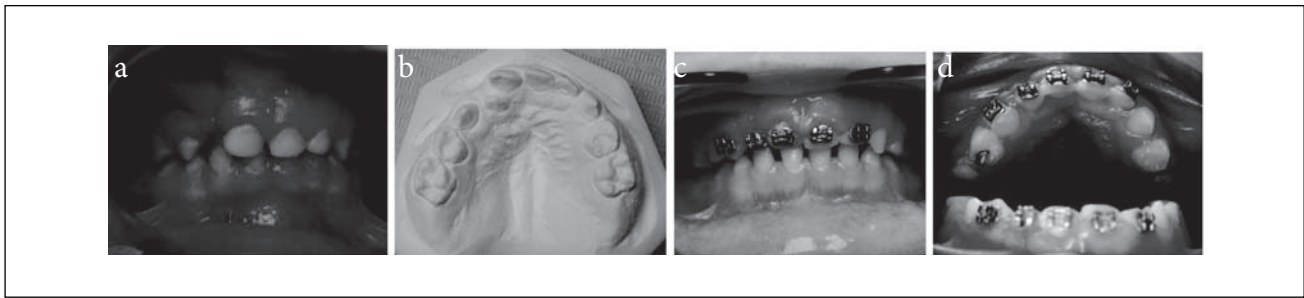


Fig. 4. The use of fixed appliances in primary dentition; a, b – before treatment; c, d – 3 month after fixed appliance treatment.

Ryc. 4. Zastosowania aparatu stałego w uzębieniu mlecznym: a,b – stan przed rozpoczęciem leczenia; c, d – stan po 3 miesiącach leczenia aparatem stałym.

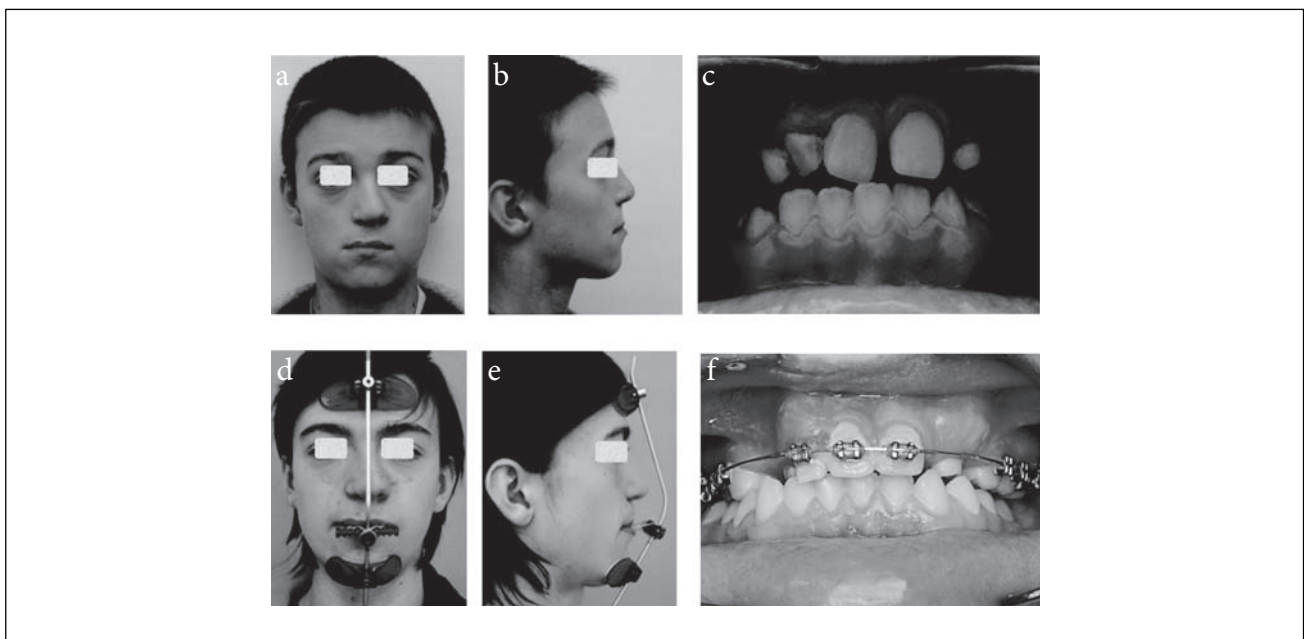


Fig. 5. Improvement of the occlusion: a, b, c – during mixed dentition treatment with the use of facial mask; c, d, e – profile and occlusal improvement – continuation of treatment with fixed appliance.

Ryc. 5. Poprawa warunków zgryzowych: a, b, c – w uzębieniu mieszanym podjęto leczenie z użyciem maski twarzowej; c, d, e – poprawa profilu oraz warunków zgryzowych – kontynuacja leczenia aparatem stałym.

mask. The purpose of the mask is to achieve an anterior sagittal displacement of the maxilla. The validity of such treatment is confirmed by studies done by other researchers (13, 14, 15). When the disorders in the transverse or sagittal dimensions are accompanied by a considerable rotation of the incisors, before applying a face mask appliance, the teeth must be correctly positioned using a partial fixed appliance. This is also emphasised in the study done by Vlachos (13).

Orthodontic treatment during the period of permanent dentition

Orthodontic treatment during the period of permanent dentition is conducted with the use of fixed orthodontic appliances, an approach also endorsed by other researchers (9, 13, 14). Three levels of treatment can be distinguished:

1. dental – achieving a correct position for permanent teeth;
2. alveolar – achieving a correct shape for the alveolar process arches in the maxilla and the mandible;
3. occlusal – achieving a correct occlusal relationship between the maxilla and the mandible.

In the case of the agenesis of a lateral incisor, there are different treatment options. The treatment may involve positioning the canine tooth next to the central incisor, moving the lateral teeth on the same side to a mesial position, and obtaining Angle's Class II for first molars on the side of the cleft. Alternatively, it can include creating a space for a prosthetic restoration or a dental implant after the completion of active orthodontic treatment. The decision on the type of restoration depends on each individual case. However, our clinical observations indicate a higher prevalence of lateral incisors than is reported in

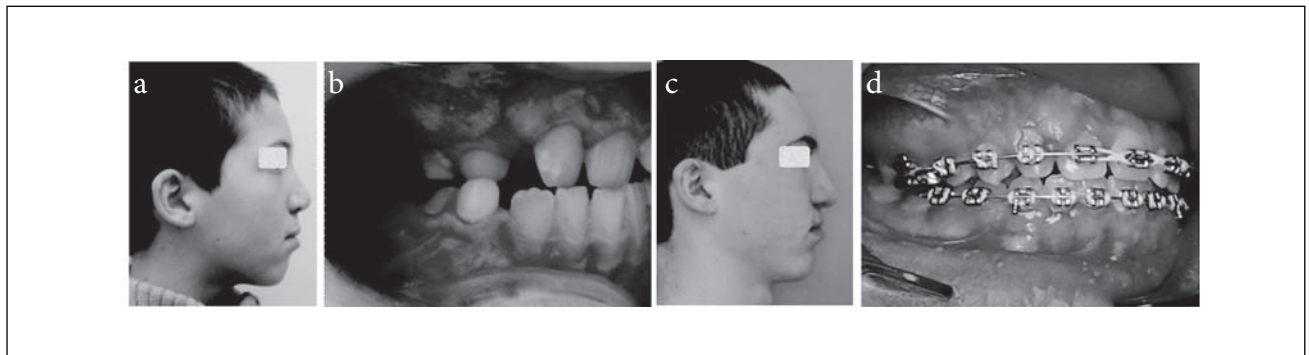


Fig. 6. The facial profile is adversely affected, although the occlusal relationships are correct: a, b – 10 year-old patient; c, d – the same patient at 15.

Ryc. 6. Pogorszenie się profilu pomimo poprawy warunków zgryzowych: a, b – pacjent 10 lat; c, d – ten sam pacjent w wieku 15 lat.

other sources, which may be linked to the early primary bone graft into the maxillary alveolar process.

The permanent dentition period is the period of the pubertal growth spurt when the anterior growth of the mandible is often insufficient in relation to the surrounding craniofacial structures. This is also emphasised by other authors (9, 16). The facial profile is then adversely affected although the occlusal relationships are correct (Fig. 6).

Following active treatment with the use of a fixed appliance, maintenance treatment is implemented which involves using removable retainer plates with the recommendation of applying them nightly for the rest of the patient's life. In special cases maintenance treatment may simultaneously include a retainer wire bonded to the teeth in both dental arches.

Orthodontic preparation for a distraction procedure

In patients with abnormal maxillary growth where the skeletal discrepancy is considerable and the phase of growth is not yet complete, distraction osteogenesis of the maxilla is performed, the aim of which is to advance the upper jaw (Fig. 7).

The advantage of this method is the fact that the jaw expands forward gradually, which promotes the good adaptation of the surrounding soft tissue. This is also emphasised in the works of other authors (17, 18).

Multidisciplinary treatment after completion of growth

As demonstrated in the works of other authors, preparation of dental arches for orthognathic surgery, such as a maxillary or mandibular osteotomy, involves an expansion, if necessary, of the upper arch, as well as alignment and decompensation of the incisors (19). If any teeth are missing, prosthetic rehabilitation, implant treatment or an autogenous tooth transplant are performed.

There are a number of differences between the orthodontic treatment used at the Institute of Mother and Child and that used in other centres which

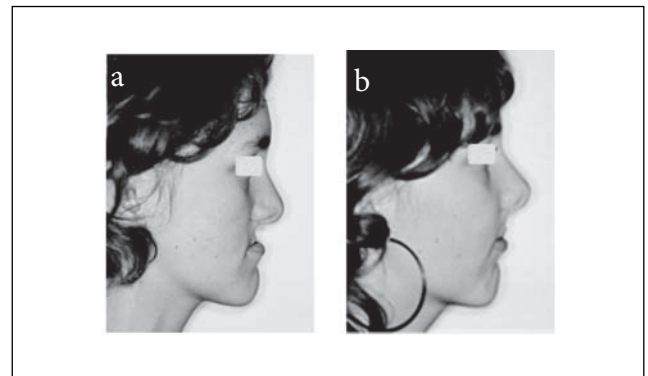


Fig. 7. Improvement of facial profile after distraction osteogenesis: a – before distraction; b – after distraction.

Ryc. 7. Poprawa profilu po dystrakcji szczęki: a – profil przed zabiegiem; b – profil po zabiegu dystrakcji.

specialise in the treatment of patients with a cleft lip and palate.

1. Pre-operative treatment using a McNeil plate is not used in infants, because of the early one-step surgical correction of cleft primary and secondary palates.

2. Removable appliances are not used in order to eliminate crossbite before an early primary autogenous bone graft into the alveolar process.

3. In primary dentition, after a transplant, either removable or fixed appliances are used depending on the clinical conditions and the level of cooperation with the children and their parents/guardians. Tooth reduction after correcting any dental and occlusal disorders is performed only in cases where it is justified.

4. During the period of permanent dentition when there is a considerable skeletal discrepancy before the completion of growth, in some cases distraction osteogenesis of the maxilla is performed.

5. In accordance with the Eurocleft recommendations and as part of the Programme of Orthodontic Care for Children with Congenital Craniofacial Disorders, an IMC standard orthodontic assessment is conducted in children at the ages of 5, 10 and 15. This assessment

involves an anamnestic and clinical examination, preparing diagnostic models, photographic documentation, along with radiographic examination including a pantomogram, a lateral cephalometric radiograph, and, where appropriate, also computed tomography.

CONCLUSIONS

Orthodontic treatment at the Warsaw Institute of Mother and Child is an integral part of the multidisciplinary care for patients with a cleft lip and palate. The purpose of effective treatment is to create optimal dental and occlusal conditions for the correct growth and development of craniofacial structures. Orthodontic care (active and passive periods) of a child begins with their first visit to an orthodontic surgery and continues until the desired orthodontic outcome has been achieved.

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Conflicts of interest/Konflikt interesu

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