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Prosthodontic Treatment of Children – Cases Reports*

Leczenie protetyczne dzieci – opis przypadków

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A – concept; B – data collection; C – statistics; D – data interpretation; E – writing/editing the text;
F – compiling the bibliography

Abstract

Children as young patients need specific methods of communication with the dentist. The necessity to use the dental prosthodontics is caused by the premature loss of deciduous as well as permanent teeth which is related to genetic diseases and acquired illnesses. The main objective of this paper was to analyze the etiology of children dental prosthodontics, as well as methods of dental and prosthodontic rehabilitation. The chosen medical documentation of patients treated in the Department of Prosthodontics of Wrocław Medical University were used as materials. The clinical part of the paper was based on the medical history and photographic documentation of patients. Among the group of subjects the authors selected 4 children with various diseases, i.e.: baby bottle caries (as the most common cause of dental restorations in children), *dysplasia ectodermalis*, Gorlin-Goltz syndrome, Papillon-Lefevre syndrome – *keratoplasma palmoplantare cum periodontitis* (rare diseases but also resulting in the use of dentures). The characteristics of the disease and the methods of dental treatment were taken into account (**Dent. Med. Probl. 2013, 50, 1, 106–113**).

Key words: children's prosthodontics, bottle caries, ectodermal dysplasia, Gorlin-Goltz syndrome, Papillon-Lefevre syndrome.

Streszczenie

Dzieci jako młodzi pacjenci wymagają zastosowania swoistych metod pozwalających na właściwą komunikację ze stomatologiem. Konieczność zastosowania protez zębowych u dzieci wiąże się z przedwczesną utratą uzębienia mlecznego i stałego, co może mieć podłoże genetyczne lub nabyte. Celem pracy była analiza przyczyn stosowania uzupełnień protetycznych i metod rehabilitacji stomatologicznej w wybranych przypadkach. Materiał do badań stanowiły karty pacjentów przechowywane w Katedrze i Zakładzie Protetyki Stomatologicznej Akademii Medycznej we Wrocławiu. Część kliniczna pracy opierała się na przeprowadzonym wywiadzie stomatologicznym i dokumentacji zdjęciowej pacjentów. Spośród grupy badanych wyselekcjonowano 4 osoby z różnymi jednostkami chorobowymi – *baby bottle caries* (jako najczęstsza przyczyna stosowania uzupełnień protetycznych u dzieci), *dysplasia ectodermalis*, zespół Gorlina-Goltza, zespół Papillon-Lefevre – *keratoplasma palmoplantare cum periodontitis* (choroby rzadko spotykane prowadzące do zastosowania protez). Uwzględniono cechy charakterystyczne choroby oraz metody postępowania stomatologicznego (**Dent. Med. Probl. 2013, 50, 1, 106–113**).

Słowa kluczowe: protezy dziecięce, próchnica butelkowa, dysplazja ektodermalna, zespół Gorlina-Goltza, zespół Papillon-Lefevre.

The most commonly children prosthodontics are partial removable dentures due to premature loss or lack of tooth buds. In practice we also use the complete dentures, but significantly less

often [1]. Due to the specific skeletal differences in young patients all prosthodontics undergo modification. It can be said that such prostheses are between dentures and orthodontics because they act

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as a functional appliance. They also meet the so-called function – space maintainers, they improve the chewing function, they improve the aesthetic appearance. Mostly at mid-board extension we use elements such as screws (usually Fisher's) or spring. These solutions are known primarily from moving orthodontic appliances [2].

The Fisher's screw allows an even sliding of the plate of a prosthesis in two opposite directions when unscrewing and thus determines the denture adaptation to a rapidly growing base of bone structures [2].

Such modified complement grows with the child. This does not change the fact that the children prostheses should be changed frequently.

The patients from the circle of authors' interests were in the developmental age when the growth of stomatognathic systems is very intense, so frequent checks and adjustments are inherent during such visits.

A child is a unique patient therefore requires a different approach than in the dental prosthesis – patient relationship. Everything that is new and strange and incomprehensible awakens in a young person fear and reluctance to cooperate with the dentist [3].

Non-verbal communication (an appropriate intonation) when talking to a little patient as well as dentist's face expression makes the communication much easier in the dental clinic [3]. The child is very sensitive to subtle signals sent by the doctor, negative emotions cause him anxiety and poor cooperation or even its complete absence.

The use of euphemisms allows you to "translate" the names of obscure, sometimes terrifying tools and preparations used in the dentist's office with reference to well-known baby items [3] – the mass of impressions can be defined as a special dough/clay, while the saliva ejector – elephant etc. This makes it much easier to carry out dental procedures because children like to play with clay.

The tell-show-do technique [3]. The authors believe this is the most important technique used on young dental patients. The method is based on a short story about what the doctor will perform sequentially, then showing the tools they will use (for example, we can give the child the second mirror during the dental treatment, making it possible to watch their teeth), and finally following the treatment.

The positive reinforcement technique [3]. Rewarding a child for its cooperation during the visit in a doctor's office or small gifts such as in this case, rewarding a child who is reluctant to use prostheses, for wearing it for a certain period of time.

The effects of premature loss of teeth without prosthetic rehabilitation are very serious,

often require long orthodontic treatment. These may include: lack of space for permanent teeth, shift, rotation of adjacent teeth, lack of conditioning stimulus of bone calcification and eruption of permanent teeth, pseudomesiocclusion, partial distocclusion, frontal crossbite, abnormal bite, slurred speech, chewing activity [4].

Case Reports

In this study the authors present four cases, which cause the need for prosthetic treatment of children – bottle tooth decay and malformations.

Malformations are internal and external disturbances in embryonic development, present at birth but often recognizable only after the neonatal period. There are a number of divisions of these findings, one of the most frequently used stands as [5]:

- small disadvantages – they do not require treatment or may require only correction,
- large disadvantages – they require intervention and tend to give long-lasting medical and/or psychological effects (our cases belong to this group).

The classification distinguishes the following pathogenic malformations:

- malformations – disturbances in the creation and development of tissues during embryonic age,
- dysplasia – abnormal cell organization and function of the tissue,
- interruptions (disruptions) – disruption of permanence of originally correct tissue.

The patients received the dentures for prevention, treatment and retention.

Case I

Baby bottle caries (Figs. 1, 2, 3), differently known as an early childhood caries (ECC). It is a form of tooth decay that is characterized by a very acute course. According to the American Academy of Pediatric Dentistry the frequent consumption of drinks that contains carbohydrates (eg, juice, milk) increases the risk of tooth decay [6]. Bad eating habits without adequate preventive measures can lead to a characteristic picture of caries in susceptible infants and young children. In a short time, it leads to a destruction of the tooth. It appears suddenly and the most affected by the changes are the upper incisors. It is most common in the dentition of infants and preschool-aged children who are breastfed for too long or fall asleep with a bottle of sweet drink or milk in their mouths [6]. The common cause is also feeding children using dummy previously dipped in honey.



Fig. 1. Patient without the the dental prosthodontics

Ryc. 1. Pacjent bez protezy



Fig. 2. Patient with the dental prosthodontics

Ryc. 2. Pacjent z protezą



Fig. 3. The dental prosthodontics – lingual view

Ryc. 3. Uzupełnienie protetyczne, widok od strony do językowej

Much evidence shows that the ECC is a contagious disease and that *Streptococcus mutans* is the main microbial factor. The disease process begins

with the transfer of bacteria to the child vertically (from caregiver to child) as well as horizontally (eg, between other members of a family or children in daycare) [6].

The case is a five-year-old boy treated from February 2010 in the Department of Prosthodontics, Wrocław Medical University. No systemic, chronic, genetic diseases.

The reason for prosthodontic treatment is the bottle tooth decay, which resulted in the loss of the upper deciduous incisors.

The child up to 20 months of age was fed with a bottle, and at the request during the night – parents primarily served sweetened tea.

The first mobile prosthesis was received in March 2010 – it was a partial denture with a Fischer's screw, rebuilding four upper incisors. In October 2010, after the growth jump an adjustment was made.

During the adaptation period for about a week the boy complained about a foreign body sensation in the mouth. Originally he was using the prosthesis for 3 hours a day, after about 6 weeks he did not want to take it off even to sleep. His peers in kindergarten know of the prosthesis, they accepted it (even want to try it on). Nowadays the boy wears the dentures happily, cares for its cleanliness, helps with washing it.

Conclusion to the case I: Consequences of BBC include: a higher risk of new carious lesions (primary and permanent teeth), increased treatment costs, risk for delayed physical growth and development, loss of school days, increased days with restricted activity, diminished ability to learn and diminished oral health-related quality of life [6]. Therefore it would be better to prevent children from teeth loss at young age – although dentures restore most of the teeth functions it is more recommendable to prevent the existing dentition from decaying. The most advisable methods include: eliminating saliva-sharing activities (eg, sharing utensils, orally cleansing a pacifier) – it helps decrease acquisition of cariogenic microbes, brushing teeth (twice-daily) with fluoridated toothpaste, avoiding high frequency consumption of products with sugar, regular visits to dental clinics to ensure all infants and toddlers have access to dental screenings, counseling, and preventive procedures [6].

Case II

Ectodermal dysplasia (hypohidrotic ectodermal dysplasia, HED) is a term that describes a group of diseases characterized by defects in the band structures of ectodermal origin, such as teeth, skin, hair, nails, sweat glands, sebaceous glands, etc. Disorder is hereditary, autosomal associated with the X chromosome, is carried by women, but manifests itself in men [7].

In 1984, Freire-Maia and Pinheiro M. have identified two ectodermal dysplasias groups (A and B). The group A is declared when the at least two characteristics appear from among the following: hair disorders, dental anomalies, nail dysplasia, sweating disorders.

In group B, at least one of the above mentioned characteristics is necessary and one symptom of ectodermal origin (skin lesions, in the organ of vision and hearing).

The most famous is the ectodermal-hipohidrotic form (a small amount of sweat glands). The most severe form is gland-free form. The characteristic features of patients with this syndrome are silky, thin skin – gland failure, warm, dry and constantly flaky skin. Head hair are usually blonde, there may be a lack of eyebrows and eyelashes. Other features embodied on the face are: emphasized frontal tubers, broad nasal bridge, the senile general appearance of the patient [7, 8].

In the mouth the underdevelopment of the jaws, teeth number reduction, microdontia, enamel hypoplasia can be noticed. Additionally, dentation is delayed – until about the beginning of the second year of life. The most characteristic is the shape of the incisors, as they are tapered. Patients with this disease have a tendency to atrophic mucosa of the mouth [8].

The case is a four year old girl treated since December 2009 in the Department of Prosthodontics, Wrocław Medical University. The lack of hair on the head can be noticed, the skin is pale, the patient does not sweat (the characteristics of the disease, which affects a child).

In June 2010, the authors handed over the first partial upper denture with Fischer's screw (5 teeth) and the bottom (6 teeth). In December 2010 – new dentures were made because of the growth spurt.

Parents urged the child from the beginning to wear the dentures. The girl was reluctant to use the restoration – the reason was discomfort in the mouth, the patient after some time adapted to the use of the dentures.

Conclusion to the case II: Clinical diagnosis of ectodermal dysplasia is difficult because the identification of the precise syndrome could be a challenge without collaboration between the patient and the different specialties concerned [9]. The diagnosis becomes easier during childhood based on the medical history and clinical examination [10].

Patients with ectodermal dysplasia are accompanied with severe case of oligodontia or even anodontia. The more severe dental agenesis presented the greater evidence of the maxillary abnormalities – maxillary hypotrophy, maxillary retrusion and

displace, protuded mandible [9]. Oligodontia and anodontia result in the need of prosthodontics usage. Treatment may include: a removable denture, a fixed partial denture, an overdenture, complete denture prosthesis or an implant retained prosthesis [11]. Implants are usually used in adult cases but some specialists recommend an early insertion of dental implants in mandible (the transversalskeletal or alveolo-dental changes are less dramatic as in the maxilla) in children with severe hypodontia [10].

Case III

Gorlin-Goltz syndrome (nevoid basal cell carcinoma syndrome – NBCCS) (Figs. 4, 5). Disease with autosomal dominant inheritance – PTCH1 gene mutations in the chromosome 9. It is characterized by an increased predisposition to basal cutaneous cancer (BCC), embryonic medulloblastoma, glandular-cystic epithelioma, cancer of the esophagus and bladder, and multiple organ anomalies. The syndrome is characterized by irregularities of the skin, nervous system, eyes, endocrine and bone disorders (ribs, vertebrae) [12].



Fig. 4. The lesions in the patient's mouth area

Ryc. 4. Zmiany chorobowe u pacjenta w okolicy ust

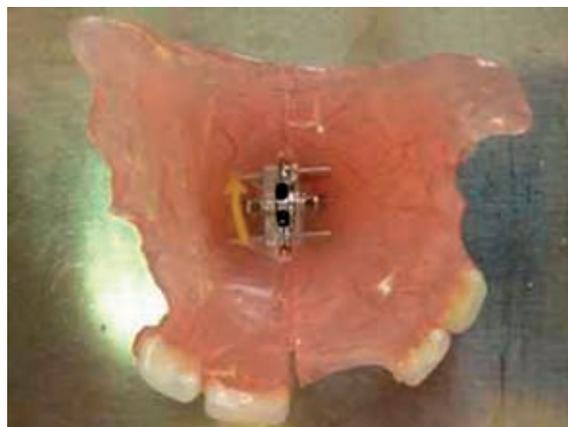


Fig. 5. The dental prosthodontics – lingual view

Ryc. 5. Uzupełnienie protetyczne, widok od strony dojęzykowej

Changes in the oral cavity include: the occurrence of odontogenic keratocysts, extensive hypodontia, increased length of the soft palate, abnormal alveolar shafts, no tooth buds, mandibular hypoplasia of the right side, narrowing of the jaw.

It is recognized that plurilamellar appearance of sickle brain calcification seen in the X-rays is a pathognomic symptom of the Gorlin-Goltz syndrome.

Diagnosis of Gorlin-Goltz syndrome is based by the presence of two major symptoms or one large and two small ones [12, 13].

The high criteria include: more than 2 BCCs or 1 BCC in a person under 20 years of age; odontogenic keratocysts, 3 or more holes on the palm or sole, ectopic calcification or calcification of the brain sickle under 20 years of age; calcification of the dura mater [8], rib abnormalities, first-degree relative with NBCCS.

Small criteria are as follows: megalencephalia, birth defects such as cleft lip or palate, eye anomaly (cataract, nystagmus), other skeletal abnormalities such as deformities of the chest, polydactyly, syndactyly or hypertelorism, radiological anomalies – anomalies of vertebral and ovarian or heart fibroma or medulloblastoma (the latter is generally found in children under two years of age) [13, 14].

Described case is a 10 year old girl treated from April 2009 in the Department of Prosthodontics, Wrocław Medical University. She has bilateral hearing loss – underwent left ear drainage ventilation and had a Vibrant implant implanted in right ear. The patient was noted with lesions on the face, neck, right leg – the state after the removal using CO₂ laser (the procedure is repeated every few months), postoperative scars. There is a clear asymmetry of the face, eyelids, eyes – right side reduced. Also flattened parietal area on the right. Numerous deficiencies in permanent tooth buds.

In April 2009, the first prosthesis were handed over – upper with Fischer's screw (5 teeth) and lower (5 teeth). In July 2010, the upper denture was replaced with a new one (4 teeth, Fischer's screw).

The girl was initially uncooperative, but the child's parents were constantly encouraging her to wear the prosthesis. The reluctance to use the appliance resulted from pressure by plate on erupting tooth 21, and the girl saw the prosthesis as an additional element that distinguishes her among her peers. After the correction of the prosthesis, involving the removal of material and making space for the erupting tooth the patient wears the denture during the day.

Conclusion to the case III: In the case of Gorlin-Goltz syndrome it is of great importance to

make an early diagnosis since the severity of complications can be reduced or avoided (malignant skin and brain tumors, maxillofacial deformities, jaw cysts) [15]. Some of the most common clinical findings of the syndrome are discovered through pantomographs [16]. The dentist, specially the pediatric and orthodontic specialties, has an important role in early diagnosis of the disease. Dentists have to remember though that a definitive diagnosis of NBCCS should be made by a multidisciplinary team comprising medical specialists and dentists [15].

The basis of Gorlin-Goltz syndrome treatment is to widely educate patient (the nature and cause of the disease, possible symptoms, contact with a genetic clinic) [13].

In case of odontogenic keratocysts appearing there are two methods of treatment – conservative (simple enucleation with or without curettage and marsupialization) and aggressive (peripheral ostectomy, chemical curettage with Carnoy's solution, and resection) [17]. In children whose permanent dentition have yet to erupt, conservative management should be considered first because an aggressive operation can have an adverse effect on teeth development, the eruption process, and the development of the involved jaw [18].

After the removal of cysts the patient can be provided with dental appliances and in the future with dental implants. Therefore prosthodontic treatment can be done only after the proper diagnosis and treatment of other maxillofacial deformities of the disease.

Also periodic checks towards new skin cancer lesions are recommended every 2–3 months. In addition, every child under 8 years of age with an established diagnosis of the disease is needed to undergo diagnosis in the direction of medulloblastoma brain (neurological consultation every 6 months, MRI once a year) [13].

Skin lesions may be treated with CO₂ laser and in primary small and well defined lesions without aggressive behaviour, curettage, electrodissection and cryosurgery techniques may also be used [19].

Case IV

Papillon-Lefevre syndrome (*keratoma palmo-plantare cum periodontitis*) (Figs. 6, 7, 8). The disease was first described by MM Papillon Lefèvre and Paul in 1924 [20]. It is an autosomal recessive abnormality linked to gene CSTC on chromosome 11 (distorted structure of cathepsin C receptor) [21]. There are rapidly progressing periodontal inflammation, bone osteolysis – loosening of teeth, periodontal destruction, loss of deciduous teeth without root resorption.



Fig. 6. Patient without the dental prosthodontics

Ryc. 6. Pacjent bez uzupełnienia protetycznego



Fig. 7. Patient with the dental prosthodontics

Ryc. 7. Pacjent z uzupełnieniem protetycznym

The clinical picture consists of periodontitis and hyperkeratosis of palms and feet (occurs in the first few months of life). Periodontitis results in loss of most deciduous teeth at the age of 4 years and an average of permanent teeth at the age of 14 years [20].

Described case is a 9 year old boy treated from April 2007 in the Department of Prosthodontics and Periodontology, Wrocław Medical University – state of the serial extraction of deciduous teeth, hyperkeratosis of the skin (hands, feet – keratoma palmoplantare), susceptibility to infections (lowered immunity) – recurrent urinary tract infections, lung, recurrent skin abscesses (*Staphylococcus aureus*).

Prosthodontic treatment of the patient is as follows:

- April 2007 – Children upper denture (8 teeth) and lower (8 teeth) with Adam's clamps and Fischer's screw,
- April 2008 – Children upper denture (8 teeth)



Fig. 8. The dental prosthodontics – lingual view

Ryc. 8. Uzupełnienia protetyczne, widok od strony językowej

and lower (6 teeth) with Adam's clamps and Fischer's screw,

– October 2009 – growth of the child – the adjustment of prostheses,

– March 2010 – further growth of the child – cut off all the clasps and shortening of the atrial parts of the prosthesis,

– July 2010 – new dentures – upper (6 teeth) and lower (6 teeth) with Fischer's screws.

Parents encouraged their son to wear the prostheses, the child from the beginning were happy about the dentures, cooperating. During the adaptation the lower appliance caused abrasions – after the correction the problem disappeared.

Conclusion to the case IV: The main reason for dental appliances for patients with Papillon-Lefevre syndrome is periodontitis. At present no treatment that saved the permanent dentition in patients has been described so far [22].

The treatment of the periodontal component of Papillon-Lefevre syndrome is very difficult. Professional dental care and the use of prophylactic antibiotics are very important but not enough. It has been shown that acitretin therapy is a safe and effective treatment in pediatric cases of inherited keratinization disorders. Oral retinoids plus

antibiotics have been reported with good response and seem to be a beneficial drug to prevent loss of permanent teeth in children [23].

Presently it seems optimal to use conventional mechanical treatment of periodontitis as well as laser therapy (diode, thermal and photodisruptive laser) [22]. Unfortunately the existing treatment is not enough to save permanent dentition therefore dentures and other dental appliances are usually used by Papillon-Lefevre syndrome patients.

Discussion

The prosthodontic treatment of children is a multi-step, long-term procedure, requiring close cooperation of restorative dentist, orthodontist and speech therapist [15, 23]. It should ensure restoration of normal function of the developing masticatory system, improving the conditions of aesthetic [9], preventing pronunciation defects and thus allowing normal functioning of the child in a peer group [23].

Dentures are used for various reasons, for which three basic groups can be distinguished: preventive, curative and prosthodontic of reten-

tion [2]. Preventive prostheses are designed to restore normal function of the masticatory organ, preventing formation of dental-occlusal disorders, parafunctions. They are made using the habitual bite, fixed in the mouth by wedging. Curative prostheses cure already established dental-bite problems, due to its function they have additional elements in the form of springs and bolts. It should be carried out using the construction bite. Dentures of retention are used after recovering from malocclusion, in order to consolidate the results of treatment.

The restoration of the correct pronunciation is as important as functional or aesthetic favors [1]. Missing teeth especially in the anterior parts predispose to the formation of the articulation disorders – lisp. The correctness of this study confirms Czarnecka, where in 10 from 16 preschool children with teeth lost had lisp. Lisp is a speech defect involving the improper implementation of the dental sounds s, z, c, dz, sz, ź, cz, dź, ś, ź, ć, dź. Dentures allow correct and clear articulation of the words in adaptation period, which results in the future in free use of speech [24].

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