REVIEWS

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Maria Mielnik-Błaszczak[1, A, B, D–F], Anna Piątkowska[1, A, B, D–F],
Anna Machowska[2, A, B, D–F], Beata Bukowska[3, A, B, D–F]

Tooth Agenesis – a Review of Literature and Own Case Studies

Agenezja zębów w piśmiennictwie i materiale własnym

[1] Chair and Department of Paediatric Dentistry University of Medicine in Lublin, Poland
[2] Dental Practice Medicare, Mińsk Mazowiecki, Poland
[3] Dental Clinical Centre, Lublin, Poland

A – koncepcja i projekt badania; **B** – gromadzenie i/lub zestawianie danych; **C** – opracowanie statystyczne; **D** – interpretacja danych; **E** – przygotowanie tekstu; **F** – zebranie piśmiennictwa

Streszczenie

Agenezja zębów jest wadą rozwojową polegającą na braku zawiązków zębów. Należy do najczęstszych wad rozwojowych uzębienia. Dotyczy zarówno zębów mlecznych, jak i stałych. Może występować jako wada izolowana, bądź towarzyszyć różnym zespołom chorobowym. W pracy przedstawiono na podstawie piśmiennictwa epidemiologię, etiologię, klasyfikację i metody leczenia braku zawiązków zębów oraz 3 przypadki hipodoncji pochodzące z materiałów własnych. Pacjenci z agenezją mają wiele problemów funkcjonalnych oraz estetycznych, dlatego powinni być objęci leczeniem kompleksowym (**Dent. Med. Probl. 2012, 49, 2, 293–298**).

Słowa kluczowe: agenezja zębów, zaburzenia rozwojowe.

Abstract

Tooth agenesis is a congenital absence of teeth. It is the most commonly registered developmental anomaly of human dentition. This pathology may affect both the primary and permanent dentition. It occurs separately or in association with another congenital syndromes. This study describes the epidmiology, aetiology, classification and treatment methods of agenesis, based on a review of literature, as well as it presents 3 own cases of this anomaly. Tooth agenesis creates functional and aesthetic problems therefore patients require complex treatment (**Dent. Med. Probl. 2012, 49, 2, 293–298**).

Key words: tooth agenesis, development disorder.

Developmental disorders of teeth, similarly to tooth decay, have been present in people's lives since the dawn of time. Excavation works proved that inborn lack of tooth buds has existed in human jaws since the paleolithic era [1].

More and more parents worried about their children come to consult dentists about the lack of tooth eruption, whereas the tooth's equivalent on the other side of dental arch has already been present in oral cavity for a long time.

Epidemiology and Classification

The lack of tooth buds is one of the most common developmental dental disorders [1, 2]. On the grounds of the number of missing tooth buds hypo-, oligo- and anodontia can be singled out. The number of missing teeth which is qualified as hypo- or oligodontia is defined in different ways by the authors. Hypodontia is the lack of one or several teeth. It is frequently accompanied with delayed

dental development and structural abnormalities, e.g. taurodontic or conical teeth. Oligodontia is the lack of more than 4 or, according to other authors, 6 teeth. Some researchers distinguish moderate oligodontia – lack of 6–9 teeth, and severe oligodontia – lack of more than 10 tooth buds. Anodontia refers to the complete lack of tooth buds.

The inborn lack of tooth buds may appear as isolated defect or may be accompanied with pathological syndromes. Oligodontia is one of the symptoms in more than 60 developmental syndromes, e.g. in different forms of ectodermal dysplasia, Down syndrome, Laurence-Moon-Biedl-Bardet syndrome, Van der Woude syndrome, Ellis-van Crevald syndrome [1–6]. Delays and changes in order of teeth eruption, no protrusion of alveolar ridge in a place where tooth eruption should occur, wide gaps between teeth, a number of remaining deciduous teeth over the age of 12 [7] – the are the symptoms which suggest the possibility of oligodontia development. The clinical diagnosis should always be confirmed by X-ray check-up, usually by pantomogram. This will exclude the presence of retained teeth.

According to different authors, the frequency of hypodontia is 1–10% and oligodontia 0.1–0.9% [1, 2]. Anodontia occurs very rarely (17 cases were described over the last 50 years) [8]. If missing teeth are observed in milk teeth (0.4–0.9%) [1], this suggests a definite possibility of missing tooth buds in permanent teeth. It has been stated that the lack of the second lower pre-molar teeth is most frequent, then the second upper incisor teeth and the second upper pre-molar teeth. The lack of the first molar tooth is extremely rare. Agenesis is sporadically observed in canine teeth and it is usually an isolated defect. The most frequent cases of missing tooth buds were observed in patients with ectodermal dysplasia. The inborn lack of teeth occurs more often in girls than boys and more frequently in mandible than in jaw [1, 2, 9].

Etiology

There are many factors which cause hypodontia. Genetic changes are one of them. It can be confirmed by the fact that hypodontia occurs more often in twins and that the lack of tooth buds occurs in successive generations [10]. More than 100 genes were identified, the mutation of which cause arrest of development and they may contribute to agenesis. They are i.a. MSX1, PAX9, AXIN2, EDA or EDAR genes [1, 2, 11–14]. It has been confirmed by research conducted in Sweden on a group of generally healthy patients with oligo- or hypodontia [12]. The lack of tooth buds may be partially a functional adaptation to environment and eating habits. The research suggests that in the future the human will have one incisor tooth, one canine tooth, one pre-molar tooth and two molar teeth in one quadrant [15].

The mother's diseases during pregnancy, taking medicine or an improper diet and the child's injuries in early childhood, chemo- and radiotherapy are the environmental causes of tooth agenesis. The inborn lack of tooth buds often occurs with cleft lip and palate. There is an evidence to connect clefts and some hereditary syndromes, e.g. Wolf-Hirschhorn syndrome, Williams syndrome with tooth agenesis by mutation of one gene (*MSX1*) [2].

Methods of Treatment

Missing tooth buds often cause aesthetic problems, difficulties in proper speech and chewing food. They may also influence emotional development of the patient and their psyche.

There is a shortened lower part in facial features, a deepened labial-chin furrow, a weak upper lip and a decreased jaw size. It is accompanied with occlusal abnormalities such as: posteroclusion, deep occlusion, cross-bite occlusion [1, 2, 7, 16].

In case of hypo- or oligodontia having been diagnosed, the patient should be provided with extensive treatment: pediatric dentistry, orthodontics, prosthodontics, dental surgery [2, 17–25].

Treatment of patients with hypodontia, depending on occlusal condition, is based on two methods [2]. In case of crowded teeth, the gaps of missing teeth can be filled by shifting the adjacent teeth. Then, the shape and colour of teeth is changed. Is usually applies to the lack of side incisor teeth. The method is not very invasive, using patient's own teeth to fill the gaps, but it does not ensure the right canine guided occlusion and protection of temporomandibular joints. If there are no crowded teeth in dental arch, the gap of the missing tooth is reconstructed. At the beginning, the patient uses a removable supplement – a denture, and after having reached a certain age they may get implants. There are also reports on teeth autotransplantation [2, 26]. It applies to patients with hypodontia in one arch and crowded teeth in the other.

The discovery that deciduous teeth may be a source of stem cells seems very promising. These cells shall produce dentine-pulp-like complex. The research on using them to cure periodontal and dental pulp diseases is being conducted and in the future it may be used to "produce" new teeth,

which could be used to cure the lack of tooth buds [1, 2, 27–30].

Case Reports

Three cases were selected from the personal material to exemplify different kinds of agenesis.

Case 1

Figure 1 presents a clinical picture of a 13-year-old female patient with a single missing tooth bud 15. The remaining primary tooth 55 is visible in the oral cavity. The diagnosis was confirmed by X-ray picture – Fig. 2. The patient was generally healthy. The medical history did not provide any essential information explaining the cause of agenesis. The ensuing situation only caused incomplete connection of tooth 12 with the line of occlusion. No functional and aesthetic changes were observed.

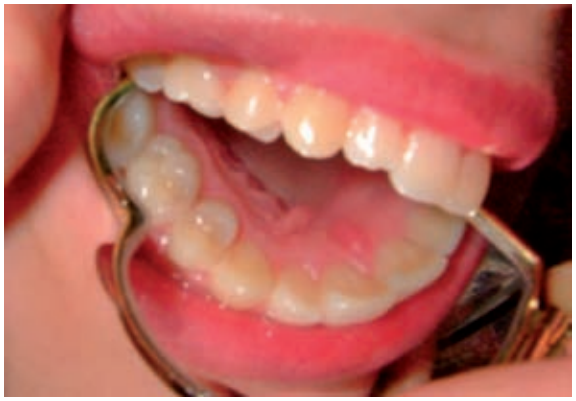

Fig. 1. Intraoral picture

Ryc. 1. Zdjęcie wewnątrzustne

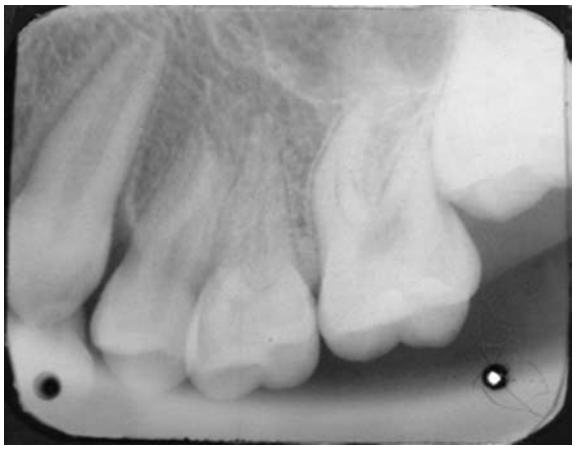

Fig. 2. X-ray picture – remaining tooth 55 and missing tooth bud 15 visible

Ryc. 2. Zdjęcie RTG – widoczny przetrwały ząb 55, brak zawiązka zęba 15

The patient is currently 25 years old. She is under permanent dental care. Tooth 55 does not show mobility. The last X-ray check-up has not certified a root resorption. She has been informed about a possible loss of the tooth due to the root resorption. In such an event the reconstruction of dental crown seems to be the most effective way of treatment.

Case 2

A 14-year-old female patient. Her mother was alarmed by the presence of only one permanent side incisor tooth in her child's jaw, with just a primary tooth on the other side (Fig. 3). The patient was generally healthy, the lack of tooth buds was not diagnosed in the family. The lack of other permanent teeth was also observed in clinical examination, which implied oligodontia (Fig. 4). A deep-

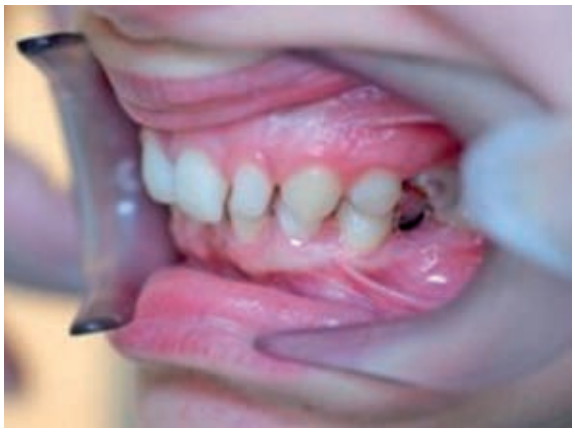

Fig. 3. Tooth 22 visible

Ryc. 3. Widoczny obecny ząb 22

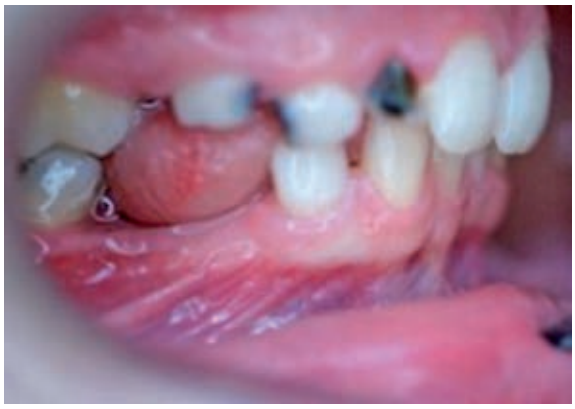

Fig. 4. Intraoral picture – lack of teeth: 12, 13, 14, 15, 43, 44, 45, remaining deciduous teeth: 52, 53, 54, 83

Ryc. 4. Zdjęcie wewnątrzustne – widoczny brak zębów: 12, 13, 14, 15, 43, 44, 45, przetrwałe zęby mleczne: 52, 53, 54, 83

ened labial-chin furrow, a constricted upper and lower arch, a receding chin (Fig. 5) were observed in an extraoral examination. The pantomograph-

Fig. 5. Patient's profile

Ryc. 5. Profil pacjentki

ic picture – Fig. 6 – was taken to confirm the diagnosis. The patient was referred for further treatment to the Institute of Mother and Child in Warsaw, which runs a special program for children with oligodontia. Each patient is individually diagnosed there – apart from dental examination, they are referred for genetic testing. Their aim is to discover the cause of oligodontia. After radiological images and models, the decision about the installation of braces in order to recreate and keep space for the missing teeth. In the future it will be possible to fill the space with a denture and after the end of dental growth – with implants. The treatment plan also covers conservative treatment – all caries cavities has been cured and the tooth 52 shape has been corrected.

Case 3

A 8-year-old male patient with a cleft hard and soft palate. Operated on at the age of 4. No inborn defects in the family. At the first month of pregnancy mother had food poisoning. The lack of many deciduous teeth in the oral cavity is visible (Figs. 7 and 8). Only one missing permanent tooth

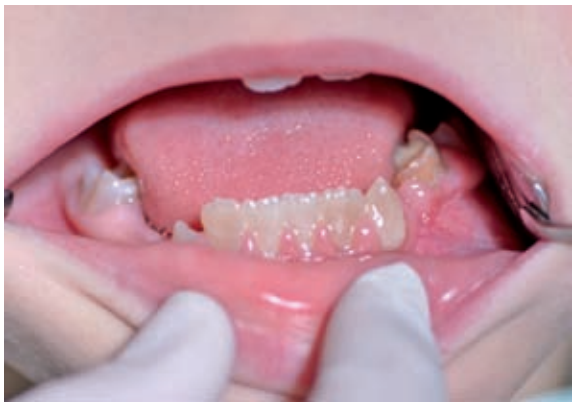

Fig. 7. Missing deciduous teeth in jaw visible

Ryc. 7. Widoczne braki zębów mlecznych w szczęce

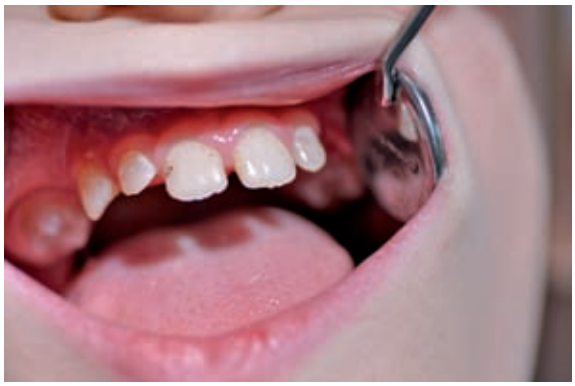

Fig. 8. Numerous missing deciduous teeth in mandible

Ryc. 8. Liczne braki zębów mlecznych w żuchwie

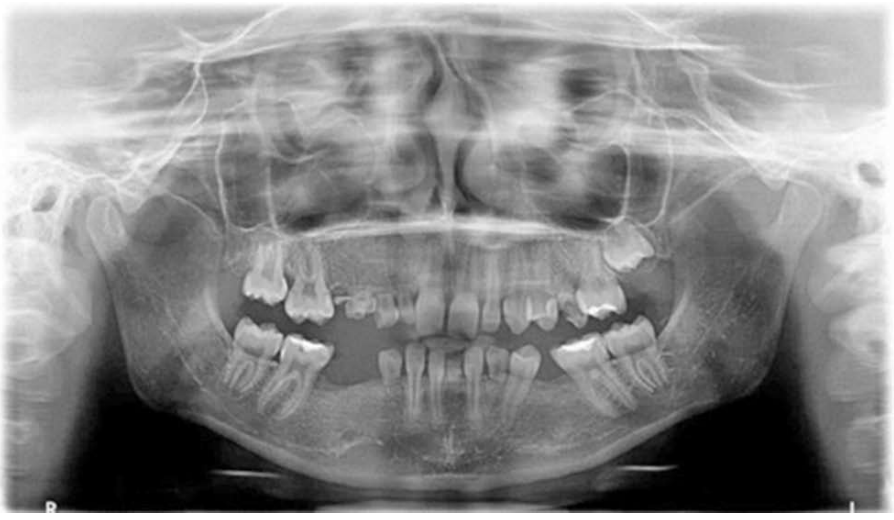

Fig. 6. Patient's pantomogram

Ryc. 6. Pantomogram pacjentki

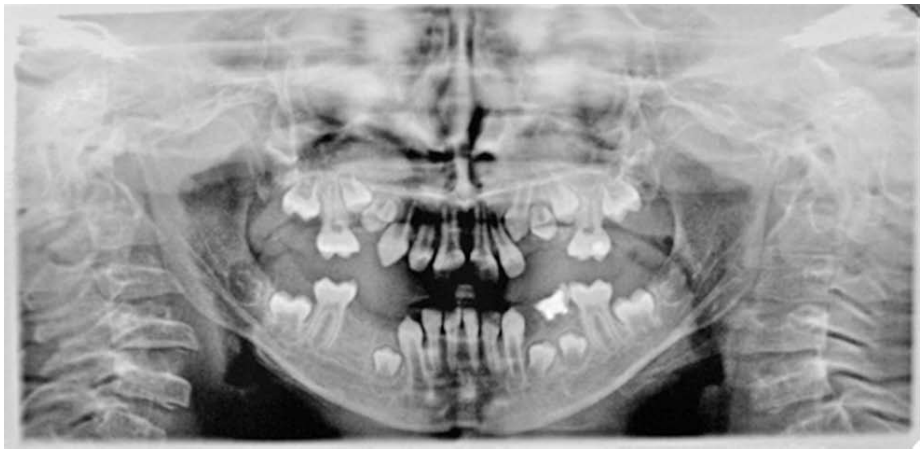

Fig. 9. Patient's pantomogram, missing tooth bud 45 visible

Ryc. 9. Pantomogram pacjenta, widoczny brak zawiązka zęba 45

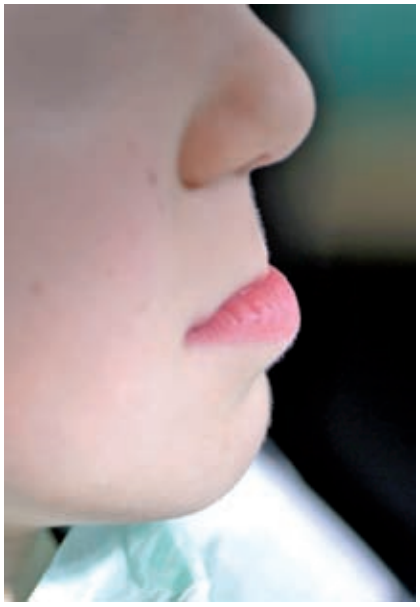

Fig. 10. Typical patient's profile with constricted upper dental arch

Ryc. 10. Charakterystyczny profil pacjenta spowodowany zawężeniem górnego łuku zębowego

bud 45 was observed in pantomogram (Fig. 9). The child is in the course of combined treatment. The non-invasive treatment of teeth has been finished. The next stage is reconstructing gaps for permanent teeth in upper arch with the use of permanent partial braces. Figure 10 presents a typical profile of a patient with constricted jaw. The patient is undergoing speech-therapy too.

Conclusions

In practice dentists usually deal with patients with the lack of single teeth, oligodontia is not that frequent. Patients with agenesis require an early and extensive treatment, which should restore the right height of occlusion, chewing function, improve facial aesthetics and the right phonetics and, as a consequence, the right adaptation to the society.

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Address for correspondence:

Anna Piątkowska
Chair and Department of Paediatric Dentistry
University of Medicine in Lublin
Karmelicka 7
20-081 Lublin
Poland
Tel.: +48 81 53 20 619
E-mail: anna.gab@wp.pl

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