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## Oral Rehabilitation in Congenital Bilateral Permanent Canine Agenesis – Case Report

### Rehabilitacja narządu żucia w przypadku wrodzonej obustronnej agenezy kłów stałych – opis przypadku

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation; D – writing the article; E – critical revision of the article; F – final approval of article

#### Abstract

Bilateral agenesis of the permanent maxillary canines in healthy individuals is extremely rare. This paper presents the case of a Polish patient diagnosed with congenital bilateral agenesis of the permanent maxillary canines as well as occlusal abnormalities in the form of left-side crossbite. To restore proper aesthetics and function, interdisciplinary therapeutic treatment was implemented. In the case presented in this paper, the aim of oral rehabilitation was to restore a functional balance by obtaining proper skeletal relationships, create optimal occlusal conditions and obtain arch continuity. After a course of orthodontic treatment involving fixed appliances on both dental arches, implantation was performed in positions 13 and 23, followed by prosthetic reconstruction. A comparative analysis of lateral cephalometric radiographs taken before the orthodontic treatment and after the completion of the combined orthodontic and implant-prosthetic treatment showed stable skeletal relationships. The values of the skeletal angles did not change, whereas the value of angle H, which describes the position of the upper lip in relation to Ricketts' e-line, increased from 1.4° to 2.8°, which reflects an improvement in facial profile aesthetics.

In the case of maxillary canine agenesis accompanied by malocclusion, interdisciplinary treatment is recommended in order to achieve optimum aesthetic and functional results (**Dent. Med. Probl. 2015, 52, 4, 521–526**).

**Key words:** hypodontia, canine agenesis, oral rehabilitation, interdisciplinary treatment.

**Słowa kluczowe:** hipodoncja, ageneza kłów, rehabilitacja narządu żucia, leczenie zespołowe.

Bilateral agenesis of permanent maxillary canines in healthy individuals is extremely rare, and the number of reports describing this phenomenon in the Caucasian population is very small [1–3]. Congenital absence of canines is more frequently observed in the Asian population [4–8] and in genetic disorders such as Down's syndrome [9].

In the case of this abnormality the aim of the treatment is to achieve balanced occlusion, create the conditions for normal function, and improve the aesthetics of the smile, as well as the harmonious appearance of the dental arch [2]. Interdisciplinary treatment requires commitment and ef-

fective cooperation on the part of a number of experts in different fields of dentistry. The aim of this paper is to present the interdisciplinary treatment of hypodontia of permanent canines in an adult male.

## Case Report

A male patient of Polish nationality, aged 23, visited an orthodontist to embark on orthodontic treatment. Anamnesis revealed that the patient still had primary canines, but otherwise he was

generally healthy and had not suffered any other health problems. The patient had no history of having suffered any trauma within the facial skeleton. In addition, he was not aware of any instances of congenitally missing teeth in his family.

A clinical examination revealed a slight asymmetry of facial features between the left and right sides of the face, retracted subnasal region, and a posterior position of the upper lip position relative to Ricketts' e-line. Intraoral examination revealed the presence of persistent primary canine teeth: 53 (Class I mobility) and 63 (Class II mobility); as well as the presence of permanent teeth in the maxilla and mandible except maxillary canines and third molars. In addition, complete left-side cross-bite was diagnosed involving teeth 22, 23, 24, 25, 26 and 27 as well as a deviated midline between the maxilla and the mandible (Fig. 1). The opening movement of the mandible was slightly disturbed in the final phase with a deviation to the left. Aural symptoms or pain connected with the temporomandibular joints were not observed. Also, in the interview the patient did not report any problems relating to the temporomandibular joint. A panoramic radiograph confirmed the presence of persistent deciduous teeth 53 and 63 with some root resorption visible; hypodontia of permanent teeth 13 and 23; and the presence of the remaining permanent teeth except the third molars (Fig. 2).

Cephalometric analysis according to Steiner revealed skeletal Class III. Selected angle parameters were as follows: SNA 75.5°; SNB 78.5°; ANB -3°. The angle between the mandibular base plane and the cranial base was 23.4°, and the interincisal angle was 144°.

A treatment plan which involved orthodontic as well as implant-prosthetic procedures was prepared and presented to the patient, who accepted it and gave his consent to initiating the treatment.



Fig. 1. Before treatment

## Orthodontic Treatment

Orthodontic treatment with fixed appliances on the upper and lower dental arches was intended to widen the jaw, eliminate cross-bite on the left side, restore correct lateral relationships and re-



Fig. 2. Panoramic radiograph before treatment

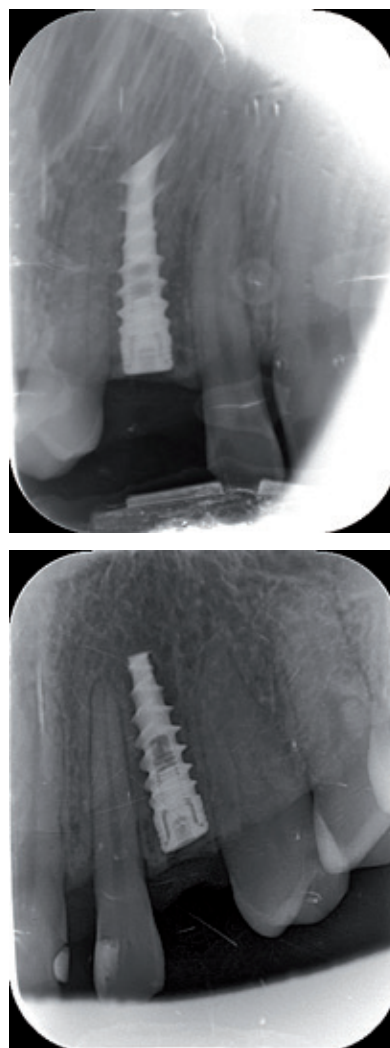


**Fig. 3.** After orthodontic treatment

duce overbite. The treatment assumed leaving the persistent primary teeth in place as long as possible in order to preserve the volume of the alveolar bone with a view to a planned future implantation after the extraction of the primary maxillary canines. The treatment with fixed appliances lasted 24 months, and the desired therapeutic effects were achieved (Fig. 3).

### Implant Surgery

Upon the completion of orthodontic treatment, primary teeth 53 and 63 were extracted. An analysis of the alveolar ridge performed using cone beam computed tomography (CBCT) showed a sufficient volume of bone for the placement of implants. Implantation was performed under local anesthesia (4% Ubistesin Forte®). First, the mucoperiosteal flap was elevated and the implant sites were prepared, into which 11.5 mm × 3.75 mm conical I5 implants (AB Dental®, USA) were inserted (Fig. 4). The wound was sutured and Sol-



**Fig. 4a.** Periapical radiograph after implant placement: a) on the right side (2), b) on the left side (1)

coseryl® was applied. The healing process proceeded without any complications. After a week, the sutures were removed. Four months later, the implants were uncovered and healing abutments were attached to the implant fixtures.

### Prosthetic Treatment

Approximately three weeks after the uncovering of the implants, under infiltration anesthesia, retraction cords were placed and the upper incisors were prepared for porcelain veneers. An impression was taken using Honigum-Mono® and Honigum-Light® in a one-step technique. Temporary veneers were then attached to the prepared teeth. After a week the final restorations were fixed using Variolink Veneer®. Next, transfer devices were used to take an impression for zirconia-based crowns. Afterwards zirconia connectors were fitted and the finished crowns were seated (Fig. 5). Prior to all the prosthetic procedures, the teeth were whitened using Philips Zoom®.





Fig. 5. After prosthetic treatment

### Retention Treatment

In order to stabilize the results of the combined orthodontic and implant-prosthetic treatment, the patient was given a thermoplastic splint for the maxillary arch and a retention plate for the mandibular arch to be worn at night.

### Discussion

The patient was diagnosed with an extremely rare agenesis of permanent maxillary canines. This condition affects between 0.27% and 2.1% of the population [10, 11]. In the presented case, ra-

diographic examination also revealed that all the third molars were missing, which is considered an acceptable norm.

Very few publications discuss the issue of oral rehabilitation in the case of bilateral agenesis of permanent canines. In the case presented in this paper, the aim of oral rehabilitation was to restore a functional balance by obtaining proper skeletal relationships, create optimal occlusal conditions and obtain arch continuity. This involved the cooperation of a number of specialists from different fields of dentistry.

Treatment planning in cases of hypodontia is done individually for each patient and a number of factors must be taken into account. First, the initial dental status and the status of the craniofacial skeleton must be evaluated. It is also important to take into account the patient's aesthetic expectations and their financial capabilities. In the case presented here, orthodontic treatment could follow two courses and involved either closing the gaps created by the missing teeth through a mesial displacement of the first premolars to the location of the missing canines with first molars in Angle's Class II; or preparing space in the maxillary arch for the future implantation of teeth 13 and 23 and their subsequent prosthetic reconstruction. In the presented case, an analysis of the shape of the teeth, occlusal and skeletal relationships as well as the facial features indicated that the best solution would be to increase the number of teeth in order to provide better support for the soft tissues, namely the upper lip. When a decision is taken to implement implant-prosthetic procedures, the aim of orthodontic treatment is to achieve a correct relationship between the maxillary and mandibular arches, restore an appropriate amount of space for the implant, and obtain a parallel position of the roots of the adjacent teeth to ensure safe implantation [12], which in the case described in this paper was fully achieved. A lateral cephalometric radiograph taken after the completion of the treatment showed a correct position of the implants in the sagittal plane (Fig. 6).

Implantology has made enormous progress in recent years. The use of intraosseous implants for the reconstruction of partial or complete tooth loss is a well-documented method of treatment, and the phenomenon of their osseointegration has been extensively explored. Increasing pressure from patients in terms of the aesthetic appearance of dental restorations forces dental practitioners to choose the best type of restoration as well as continuously modifying surgical treatment protocols. The absence of even a single tooth which has not been prosthetically restored results in irreversible adverse changes to the surrounding hard and soft



**Fig. 6.** Cephalometric after implantation

tissues. The easiest method of replacing a missing tooth is a fixed prosthetic restoration consisting of splinted crowns supported by the neighboring teeth. However, such a solution is invasive and destructive to the pulp and hard tissues of the teeth adjacent to the gap [13]. In addition, it also does not prevent the loss of alveolar bone. An alternative solution may be the use of restorations based on intraosseous implants. An essential prerequisite for effective and aesthetic implantation, though, is the availability of an appropriate amount of surrounding and supporting tissue. A sufficient amount of bone at the implant site, as was the case in the patient described here, usually guarantees a successful outcome. However, in situations where the volume of bone is insufficient and when additional periodontal problems occur, it is advisable to perform tissue augmentation in the form of bone grafts, connective tissue grafts or guided bone regeneration (GBR) [14].

Another important factor which affects the long-term clinical results of implant treatment is the geometry of the implant surface. Implants with a smooth machined surface show the greatest rate of failure, reaching 18.5–26% for 7 mm implant lengths. Increasing the surface geometry of the implant through appropriate conditioning which produces a more porous structure, such as plasma-spraying or the use of special granules, increases contact with the bone tissue. This means that the forces are distributed over a larger surface of the implant. Published studies indicate that using short implants with a smooth surface renders worse results than using implants with a rough surface [15]. This is also confirmed by the clinical case present-

ed in this study. The surface of an implant can also be increased by increasing its diameter. According to Mitsch, increasing the width of an implant by 1 mm can increase its functional surface by 30% to 200% depending on the shape. Studies using the Periotest method (PTV) showed a marked improvement in the stability of an implant corresponding to an increase in its diameter during the control period immediately after implantation, after 6 months, and after one and two years [13]. It is believed that the proper distribution of blood is one of the most important factors determining the development and maintenance of a correct biological width, which primarily depends on the density of the network of blood vessels, their structure and the physiology of the individual capillaries and the vascular endothelium [16].

A comparative analysis of lateral cephalometric radiographs taken before the orthodontic treatment and after the completion of the combined orthodontic and implant-prosthetic treatment showed stable skeletal relationships. The values of the skeletal angles did not change, whereas the value of angle H, which describes the position of the upper lip in relation to Ricketts' e-line, increased from 1.4° to 2.8°. Also the nasolabial angle decreased from 115.5° to 113.2°, which reflects an improvement in facial profile aesthetics. The obtained treatment outcome was highly satisfying for the patient.

In the case of maxillary canine agenesis accompanied by malocclusion, orthodontic treatment and prosthetic rehabilitation with the use of dental implants are recommended in order to achieve optimum aesthetic and functional results.

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