An Interdisciplinary Approach to the Treatment of Oligodontia

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Summary

The Introduction defines hypodontia, oligodontia and anodontia, citing their frequency and giving a description of accompanying occurrences. The need for an interdisciplinary approach to the solution of these anomalies is stressed. This is followed by a case presentation of a patient with oligodontia, in whom, apart from the wisdom teeth, 8 permanent teeth were missing. A method of orthodontic treatment is described and final prosthetic rehabilitation. The patient was treated with mobile and fixed orthodontic appliances in order to achieve optimal placement of the teeth and intermaxillary relations, as a prerequisite for successful prosthetic rehabilitation. The prosthetic construction was performed with ceramic bridges in both jaws, which provided a satisfactory functional and aesthetic result. In conclusion the theoretical possibilities for orthodontic treatment and alternative prosthetic solutions in diagnoses in which there is a reduction in the number of teeth, are discussed.

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Introduction

Hypodontia is a congenital absence of one or more teeth of primary or permanent dentition (1). The prevalence of hypodontia in permanent dentition occurs in 2% - 10%, while in primary dentition it is rarer and occurs in 0.1% - 0.9% (2).

Oligodontia (multiple aplasia) is defined as a congenital absence of 6 or more teeth, including the third molars, and prevalence varies between 0.25 - - 0.7% (3,4).

An extreme form of missing teeth is anodontia, or agenesis of all teeth, primary and permanent, which is extremely rare (1).

Oligodontia may occur alone, as part of a syndrome, or in more serious systemic disturbances, such as for example ectodermal dysplasia. If oligodontia is a part of a syndrome there are usually changes on the skin, nails, eyes, ears or skeleton. It is an integral part of more than 120 syndromes (6,7). The most frequent syndromes during which oligodontia is manifest are Rieger's syndrome, Oto-palato--digital syndrome, Oro-facial-digital syndrome, Oculo-facial-cardio-dental syndrome etc. (8).

According to recent investigations in the majority of cases oligodontia is genetically conditioned, although this does not exclude the presence of external and internal factors, such as X-ray therapy, application of

certain medications, infectious diseases, traumas, endocrine and intrauterine disorders (4,6,7,9).

In most cases anomalies in the number of teeth (hypodontia, oligodontia) are connected with anomalies in the shape and size of the teeth. Microdontia often occurs in persons with oligodontia (3,10). Today it is considered that the genetic basis of microdontia and hypodontia is identical (1). Oligodontia is often accompanied by taurodontism, disturbed mineralisation and late development of teeth, particularly of the second premolars (10).

While patients with hypodontia of one or two teeth can be exclusively treated orthodontically, patients in whom oliogodontia is diagnosed, frequently accompanied by the aforementioned occurrences, require an interdisciplinary or multidisciplinary approach.

The present study describes an interdisciplinary approach to the treatment of a boy with oligodontia in permanent dentition, from the first orthodontic examination to final prosthetic rehabilitation.

Case presentation

A fourteen-year-old boy, the first of three children in the family, was examined in the Department of Orthodontics University of Zagreb in 1997. After case history and clinical examination an orthopantomogram was performed, study casts made of both jaws and gnathometric and craniofacial analyses carried out.

The case history disclosed that he had been born with syndactylioma of the second and third toes on both feet. Eruption of primary teeth had been normal, with no signs of hypodontia. At 6 years of age he had had an operation for adenoid vegetation, prior to which he had breathed through the mouth. He now has normal, nasal respiration. His speech is normal. He has two brothers, aged 4 years and 18 months, with no signs of hypodontia in primary dentition. Hypodontia was not registered in either parent or any close relatives.

Cranio-facial indexes

Skull index 71.7. The head was evaluated as dolichocephalic. Facial index 87.02, which places it in the group of mesoprosopics.

Local status of the oral cavity

Frenulum labii was within normal limits. Gingiva and parodont were healthy. Tongue normal size although infantile swallowing was observed. Oral cavity hygiene was very good. The patient had no caries. The mesiodistal diameters of the teeth crowns were reduced (upper right and left first incisors, upper second left incisor, and the lower second premolars). The upper and lower canines were of marked conical shape (wedge shaped teeth).

Maxillary retrognathism was determined. Because of extensive hypodontia the upper jaw was reduced in the transversal and sagittal direction. In the frontal segment reverse overlap and positive incisal step (1.5 mm) were observed, and unilateral cross bite in the lateral segment (Figs. 1,2)

Examination of the face revealed a mildly concave appearance, with a marked nasolabial groove (Fig. 3).

Radiographic diagnostics

Examination of the orthopantomogram showed the absence of germs of eight permanent teeth (with the exception of the third molars) in both jaws, i.e. six teeth in the upper jaw and two in the lower jaw (15,14,12,23,24,25,34,44), with three persisting primary teeth in the upper jaw (55,64,65). The roots of these primary molars showed almost complete resorption, in spite of the fact that there were no successors. The primary teeth were later extracted. The roots of the permanent teeth were of normal size and shape (Fig. 4).

Gnathometric analysis

The posterior width of the upper dental arch was 43.5 mm, which is 5.5 mm smaller in relation to the mean value for boys of this age (11).

In the sagittal dimension, class II was found on the first molars (reconstruction I) and reverse overlap of the incisors.

The height of the dental arch was 11 mm, which was determined by measuring the vertical analysis. This, together with the palate index of 29.6, indicated a moderately high palate.

Treatment

Because of the specificity of the diagnosis following the diagnostic procedure it was clear that

after the orthodontic treatment there would be a need for prosthetic rehabilitation.

Initially an upper and lower active plate was constructed with screws, in order to increase the width of the upper jaw. A year after treatment with mobile appliances treatment was continued by the fixed technique of a straight wire with the system Roth lock 0.018 (Figs. 5,6,7). Three months later, after the final phase of levelling, a protrusive arch (0.016 x 0.022) was placed in the upper jaw, with the object of correcting the reverse overjet. The aim was to correctly control the teeth in both jaws in order to achieve optimal placement for their prosthetic rehabilitation. Six months after the commencement of treatment study impressions were taken with the object of consulting a specialist in dental prosthetics. For stability of the occlusion and symmetric loading of the abutments of the fixed--prosthetic replacement, it was proposed that the upper left second incisor be moved into the position of the missing canine, and that the unilateral cross bite in the area of the upper molars should be corrected. For this purpose a transpalatinal arch was constructed, according to Goshgarian (Fig.8). During the following four months, the second upper incisor was moved into the desired position (in place of the missing canine. By means of the transpalatinal arch, congruent occlusive relation and normal overlap of the incisors was achieved.

During the following consultation with the prosthetist, based on analysis in the articulator of casts of both jaws, it was concluded that the upper right canine should be positioned more buccally, because of the possibility of normal prosthetic reconstruction of latero-occlusion.

The final orthodontic treatment and prosthetic rehabilitation

After the fixed orthodontic appliance had been removed (Figs.9,10) the patient immediately started prosthetic rehabilitation. After all the teeth in the lower jaw had been prepared a retainer, constructed by biostar technique, was inserted. At the same time a retainer was also fitted on the upper teeth with the object of maintaining the achieved condition until prosthetic rehabilitation. After the prosthetic rehabilitation in the lower jaw, the teeth in the upper jaw were prepared and a new retainer inserted, made according to the model obtained after grinding the teeth. In this way the teeth were protected and recurrence was avoided.

By prosthetic rehabilitation the unerupted teeth were compensated and the inadequate shape of the upper frontal teeth was aesthetically corrected, and also the conical shape of the upper and lower incisors. Apart from the foregoing the problem of diastema in the anterior segment of the lower jaw was permanently solved. The prosthetic construction comprised a ceramic bridge in the upper jaw, consisting of 8 veneer crown-abutments (17,16,13, 11,21,22,26,27) and six veneer pontics (14,15,12, 23,24,25). By including the second molars in the bridge on both sides, adequate height of the bite and more stable occlusion in the area of the molars was obtained.

In the lower jaw the construction consisted of 8 veneer crowns and two veneer pontics. As the lower canines had almost taken the place of the lower first premolars, they were moved and held in that position by the fixed orthodontic treatment. A space remained between the frontal incisors and these canines which was prosthetically solved by veneer pontics (Fig 12).

The bridges were constructed of De Tray Carat ceramic (Figures 13,14 and 15)

Due to the extremely unsatisfactory shape of the teeth (reduced teeth crowns in the mesiodistal direction) and the conical shape of the upper and lower canines, careful preparation of the teeth abutments was necessary because of the possibility of complications, such as overgrinding the teeth and devitalisation, which was avoided.

Conclusion

The consequences of missing teeth are numerous and depend on the number and type of teeth that are missing. Most frequently speech and masticatory functional disorders occur and aesthetic problems caused by disturbed growth and development of the orofacial area, which can manifest outside the mouth (5,6).

In the case of patients with oligodontia, prompt, accurate diagnosis is necessary and careful planning of treatment, with a preconception of the final

solution. This can only be achieved by multidisciplinary cooperation, which usually includes the following specialists: orthodontist, pedodontist, oral surgeon and prosthetist (5).

From the orthodontic aspect, the consequences of missing teeth are numerous and depend on the number and type of teeth that are missing. In cases of marked aplasia the height of the lower third of the face is often reduced with a deep bite, which may give the face a square appearance (11). In children with aplasia of more than four permanent teeth maxillary retrognathism and anterior rotation of the mandibule with reduced mandibular angle are generally found (11). Retroinclination of the upper incisors also induces reduced protrusion of the upper lip. Because of the frequent changes in the size of the crowns of permanent teeth excess spacing is found with diastema, rotation of neighbouring teeth and loss of medial line. In cases of aplasia certain problems arise during orthodontic therapy. With the reduction in the number of permanent teeth, anchorage is poorer and thus the forces have to be adapted. Closing the space may also be slower and empty spaces may remain. A possible explanation may be the inadequate bony substance and poor anchor units.

During prosthetic rehabilitation in children and adolescents the same material and procedures are applied as in adults, although the plan and realisation of rehabilitation must be adapted to growth and development. It is a general rule that the final prosthetic solution should be avoided until the end of growth and development. In cases where early prosthetic reconstruction is essential, the aim should be to supply the patient with temporary solutions which satisfy aesthetic and functional requirements and avoid unnecessary damage to tissue (5,12). A prosthetic procedure requiring extensive preparation of the teeth in young patients should be avoided because of the possibility of pulp damage. Today new techniques of cementing make it possible to restore a single tooth by a ceramic onlay-crown, with much less preparation, enabling aesthetic solution in younger patients. In many cases composite onlay bridges can serve for long periods both as retention and as temporary therapy, particularly in the anterior region (13). Good long-term results are also achieved with Maryland bridges (5). When planning alternative therapy within a few years a Rochette-bridge is preferred because it is easier to remove. Partial casting of a prosthesis with a base of cobalt-chrome, formed in accordance with relevant laws on hardness and stability, is also suitable for younger adolescents (4,5).

Surgical therapy for patients with marked aplasia can include various aspects, such as autotransplantation, insertion of osteointegrated implants or orthognathic surgery. Autotransplantation is applied most frequently in those cases where aplasia is localised mainly in one jaw and the teeth from the other jaw can be utilised, e.g. in persons with asymmetric aplasia. Osteointegrated implants can be a suitable solution for patients with multiple aplasia. However, experience is limited with regard to long-term results in children and adolescents (13,14). Because of its irreversible character the different aspects of their application should be considered, particularly for younger patients. It is well known that implants react like ankylised teeth, when inserted before the end of growth of the alveolar ridge. It is therefore considered that implant therapy can be applied at the earliest when growth and development has nearly finished. In rare cases of complete aplasia, such as for example in ectodermal dysplasia, implant therapy can be recommended during childhood.

If during orthodontic treatment there is still uncertainty regarding the type of prosthetic rehabilitation, it is recommended that sufficient space should be created in the mesiodistal and vertical dimensions, in order to enable application of one of the listed prosthetic solutions.