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Case report

When should orthodontics be part of reconstruction of a degenerating dentition? A case report

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ABSTRACT

The present case report aims to describe a typical situation of an adult patient seeing her dentist for replacement of a missing tooth, but also requiring information regarding the possibilities for a return to the original occlusion as perceived by the patient based on family photos. The importance of the communication regarding the consequences of blindly following the patient's demand for a replacement of a missing tooth compared to the treatment possibilities when involving orthodontics is stressed.
The significance of maintaining a high information level in the undergraduate training regarding treatment possibilities is stressed.
The logic in dividing the treatment into separate phases defined by the solution of specific problems is demonstrated and minimizes the chair time as well as the treatment time.

1. Introduction

Occlusion is rarely totally stable and if it is, it reflects a satisfactory compensation for the age related changes of the craniofacial skeleton[1,2]. Often Class II occlusions become more Class II while Class III occlusions become more Class III. Class I occlusions seem to be the most stable[3]. It has also been demonstrated repeatedly that especially the malocclusions combined with a dysfunction as a tongue pressure or a lip catch are prone to aggravation. Extraction of one or more teeth or alteration of the marginal bone level as a result of periodontal disease also have a significant impact on the age related changes and may lead to a dysfunction and an increased deterioration of the dentition. Once observed by the patients they may consult their general dentists for advice and to have a plan for reconstruction. The co-involvement of orthodontics in such plans is very variable and depends completely on the general dentist's understanding of the possibilities offered by orthodontics. The development within implantology has made reconstruction with fixed prosthodontics possible in most cases and orthodontics may not be part of the treatment, because the adult patient is reluctant to accept braces and wants a less time consuming resolution. The acceptance of orthodontics totally depends on the patient's perception of the benefit from orthodontics in relation to the treatment goal obtainable at short and at long term. An understanding of the ongoing age related changes is important. Often the process is so slow that it remains unnoted both by the patient and the general dentist checking the patient regularly. An illustration of the changes by means of family photos may however lead the patient to understand that the main goal of any

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Fig. 1 – Family photos indicating the development of the malocclusion over the years.

reconstruction of an adult dentition must be to regain an occlusion that is excluding detrimental impact from parafunction and to establish an optimal balance in the masticatory system.

The aim of the present case report is to discuss the general dentist's approach to a patient's demand for replacement of missing teeth and to demonstrate how the selection of segmented biomechanics for the orthodontic treatment was preferential in the present case.

2. Case report

2.1. *Anamnesis*

In the present case a 50-year old woman first saw her general dentist for a replacement of a lost lower deciduous molar as there was agenesis of the permanent successor.

She also mentioned that when comparing family photos taken over the years she had noticed that her overjet and upper diastema had gradually worsened over time and therefore she asked the family dentist for a referral to a specialist (Fig. 1).

2.2. *Clinical examination*

Extraorally the patient presented with a convex profile, an insufficient lip closure and a lip catch when swallowing (Fig. 2).

The patient presented with a well preserved permanent dentition with 35 missing and minor restorations on several teeth. The results of the intraoral examination are summarized in a problem list (Table 1).

Based on the problem list a treatment goal was defined in 3D and explained to the patient on the combined tracing and occlusogram (Table 2, Fig. 3). This VTO allows for a definition of the tooth movements necessary to obtain the treatment goal.

Although the sagittal discrepancy was significant, it could be seen from the VTO that an acceptable treatment goal could be obtained by orthodontics only, avoiding a surgical intervention. As the lower face height had already increased, it was crucial to prevent the unavoidable bite opening of a leveling

Table 1 – Problem list.

CHIEF COMPLAINT	Missing premolar in the left side of the lower arch Increasing overjet and palatal impingement	
OBJECTIVE		
FACE	Increased lower face height due to vertical maxillary excess	
SMILE	Gummy smile with central diastema Hanging 23 24	
FUNCTION	Lip incompetence. Perioral strain on closure Lip catch on centrals. Palatal impingement	
DENTITION	Rotation and tipping of several teeth Missing 45 Collapsed lower dentition Flared upper anterior teeth Posterior dentition heavily restored. 38 48 present and in contact with 37 47	
OCCLUSION		
SAGITTALLY	**Right**	**Left**
Molars	Neutral	Neutral
Canines	Neutral	¾ Distal
Overjet	10 mm	
VERTICALLY		
Overbite	9 mm with palatal impingement	
TRANSVERSAL		
Scissor bite	23 24 / 33 34	
Midlines	Lower to the left 2mm	
SPACE AVAILABLE		
Upper arch	Mild spacing	
Lower arch	Severe anterior crowding, 34 displaced	
ARCH SHAPE	**Upper:** U-shaped symmetric **Lower:** V-shaped asymmetric	
ANTERIOR RATIO	80.0%	
Curve of Spee	Increased (> 5mm)	

CEPHALOMETRIC ANALYSIS
The patient has increased lower face height and slightly increased sagittal jaw relations. There is a posterior inclination of the maxilla and proclination of the upper incisors.

Fig. 2 – Pre-treatment photos.

with a continuous arch. In addition, the patient presented a lower arch asymmetry that could not be treated with a straight wire approach. A segmented appliance was therefore chosen for the correction[4]. In the upper arch a three-piece mechanics allowed for a combined intrusion and retraction of the incisal segment without posterior extrusion[5–7]. This was also beneficial to the gummy smile. In order to allow for this movement the canine position had to be adjusted and a correction of the over-erupted upper canines required selective intrusion to avoid the canting of the upper occlusal plane.

Table 2 – Treatment Goals.	
AESTHETICS	Improve the smile by leveling, alignment and retraction of upper anterior teeth.
OCCLUSION	
Sagittal	Neutral molar and canine relationship with corrected overjet.
Vertical	Elimination of palatal impingement and establishment of a better inter-incisal angle. Reduction of the Curve of Spee.
Transverse	Coordination of the arches. Restoration of the collapsed lower arch and correction of the scissor bite.
FUNCTION	Eliminate the lip catch which is maintaining and aggravating the flared upper incisors and deep bite. Provide more occlusal contact which provides a better platform for function and reduces excessive tooth wear. Resolve the traumatic palatal impingement.

The large overjet could be further reduced by a modest proclination of the lower incisors. Thereby the lip catch and the palatal impingement would be eliminated and hence function improved. Since the Curve of Spee was very deep and a complete flattening would lead to flaring of the lower incisors and more exposure of the upper incisor the goal was therefore a reduction rather than an elimination of the curve of Spee.

3. Course of treatment (Table 3)

The treatment was divided into phases. The phases in a treatment carried out with a segmented approach indicate the solution of a particular problem and not as in relation to a straight wire treatment just a change in the wire dimension.

The first treatment phase aimed to correct the position of the upper and lower canines as indicated by the VTO. Cantilevers were activated for intrusion with expansion of the upper canines and for intrusion, expansion and forward tip of the lower canines. To facilitate the forward displacement the segments were utility shaped in the lower arch. The use of TPA activated for distal rotation counteracted the effects of the cantilevers in the upper arch. In the lower arch the reactive forces from sagittal expansion and buccal displacement of the canines neutralized each other. In the lower arch the asymmetrical expansion was obtained by insertion of an asymmetrically activated lower arch which delivered more distal rotation on the right side than on the left side. This would generate expansion and a mesial force on the right side and a distally directed force on the left side. The lower lingual arch also neutralized the undesirable reactive forces from the sagittal expansion and the buccal displacement of the canines. Once sufficient space had been generated, the four upper incisors were aligned with a sectioned superelastic archwire extending from canine to canine. Figure 4 indicates the appliance and mechanics used in this phase.

The second phase was initiated when the right lower canine had been displaced sufficiently to allow the buccal tipping of the lingually inclined right lower first premolar. In order to allow for the correction of the scissor bite a temporary bite opening was done with composite onlays. The scissor bite was corrected with a custom-made spring made of .018" TMA welded to a .017X.025 TMA segment which was used as maintenance of the proclined canine (Fig. 5). In the upper arch a rectangular TMA wire was inserted into the incisors that

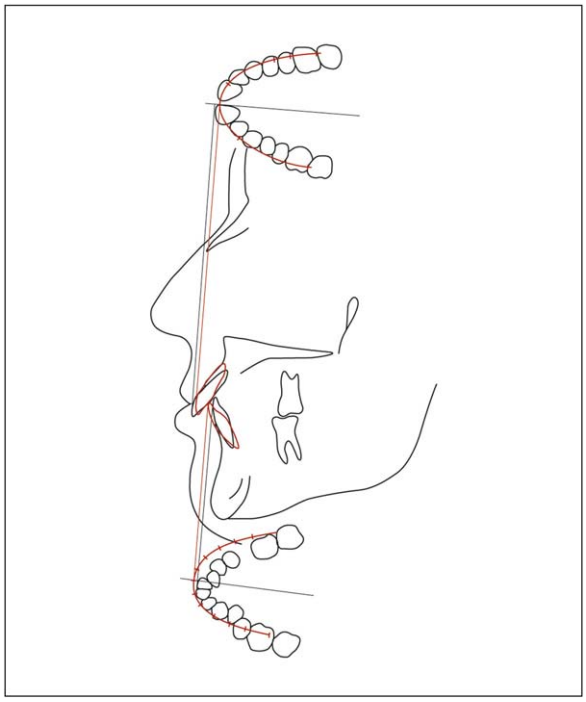

Fig. 3 – 3D Treatment plan.

Table 3 – Treatment phases.	
Phase I	Upper arch: Expand upper arche. Intrude and buccal tip upper canines with TPA with arms. Cantilevers from upper molars to canines. Initiate levelling of upper incisors. Lower arch: Expand lower arch asymmetrically. Bite opening with composite onlay. Utility shape cantilevers from lower molars to canines to displace lower canines buccally and anteriorly.
Phase II	Upper arch: Level and align anterior teeth and retract upper incisors by a 3-piece base arch. Maintain the upper cuspid position Lower arch: Correct scissor bite by a custom-made spring intruding and tipping the lower right bicuspid buccally.
Phase III	Upper arch: continuous arch for finishing. Lower arch: maintenance of the canines, levelling with overlay mechanics
Phase IV	Finishing Continuous arches and cantilever Class II mechanics on the right side
Phase V	Retention Fully balanced splint Bonded retainer 34-44. Bridge replacing 45.

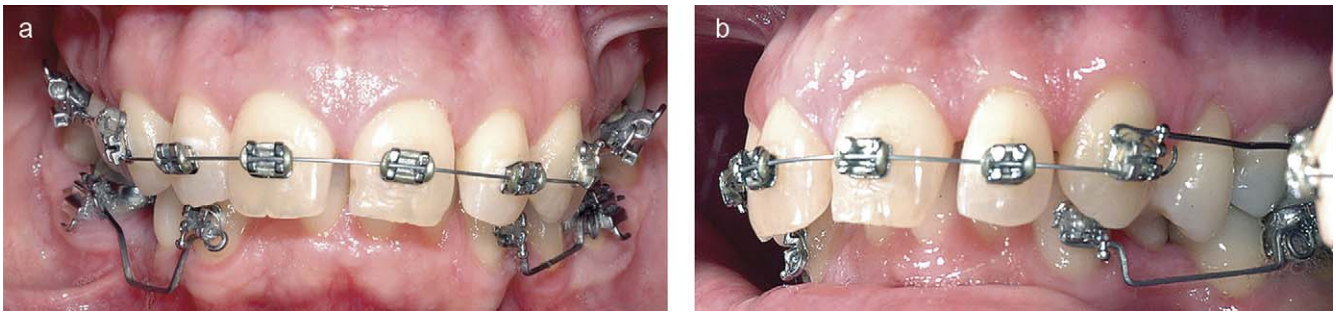

Fig. 4 – Phase I of treatment. Cantilevers constructed from .017 x .025 TMA inserted in molar tubes and attached to the canine brackets. Sectioned straightwire .016 CuNiti ligated in the upper incisors.

were further connected with a power chain. The latter was used to close the diastema and avoid flaring when retracting and intruding the upper incisors with a three-piece base arch. Simultaneously the overerupted 24 was intruded with a .017x.025 TMA segment with a rectangular loop. During this phase the canine position was maintained with two lateral segments.

The third treatment phase was the transition into a continuous arch in the upper jaw. In the lower jaw the intercanine width was maintained with a .019x.025 TMA wire while an .016 overlay system was used to align the lower incisors (Fig. 6).

The final Class II correction on the left side was achieved with a removable jig to prevent any extrusion of the anterior unit which would have been a risk with a Class II elastic (Fig. 7).

Following treatment a retainer extending from 34 to 44 was bonded in the lower arch and a fully balanced splint was prepared for the upper arch. The patient was then referred back

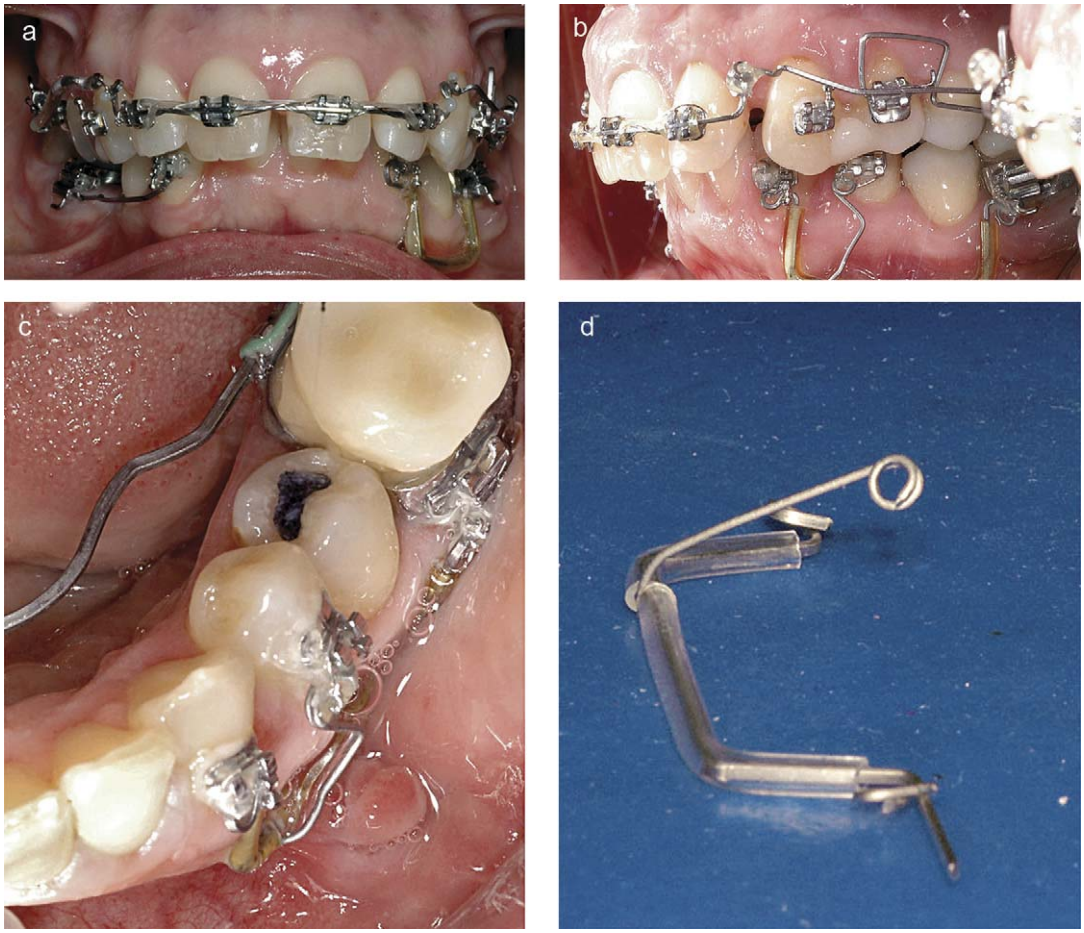

Fig. 5 – Appliance used in treatment phase II. Three-piece base arch in upper arch to retract and intrude upper incisors. Box loop inserted in 26 to intrude the 24. Lower left cantilever with arm to pull 34 into arch whilst maintaining the position of 33.

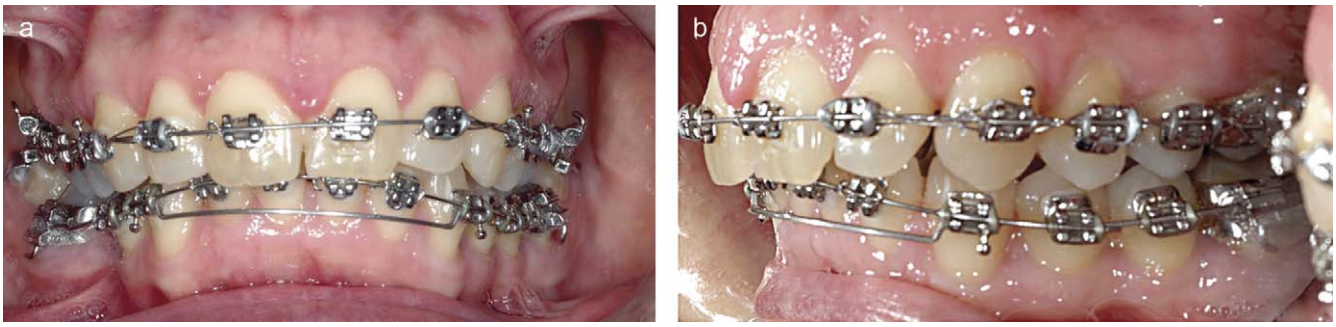

Fig. 6 – Appliance used in treatment phase III. Upper .017 x .025 TMA archwire and lower .017 x .025 TMA overlay with .014CuNi used for leveling of the lower incisors.

to her general dentist who replaced the missing 45 with a bridge.

4. Evaluation

The patient's appearance has improved significantly as seen in Figure 8. Any further improvement would require surgical intervention to reduce the maxillary excess. This option was discussed with the patient who made it clear that surgery for aesthetic reasons was out of the question. The palatal impingement and lip catch have been eliminated. There is, however, still a tendency towards a lip incompetence due the skeletal discrepancy.

A neutral molar and canine relationship with tight intercuspation was achieved partly through the Class II mechanics partly with the aid of the prosthodontic reconstructions performed by the patient's dentist (Dr. Casper Lemvig Kruse, Jysk Tandpleje Center, Muslingevej 38 A, 8250 Egå, Denmark). The overjet and overbite have been reduced by dental compensations. The collapsed lower arch was restored and coordinated to the upper arch. All rotations and tippings planned to be corrected were corrected. The posterior lower dentition remained stable and was not significantly moved. There is still a Curve of Spee present although less pronounced.

Fig. 7 – Finishing: Class II correction with removable jig showing a jig constructed from SS which is inserted in the auxiliary tube of 26 allowing for a horizontal line of action to correct mild class II relationship.

The gingival status remained stable through treatment and the proclination of the lower incisors was well accepted. This corroborated the finding earlier published by Allais and Melsen[8] No decalcifications appeared and no measurable shortening of the roots took place. The periodontist decided to also perform a gingivectomy of the upper anterior teeth while performing a frenectomy following space closure procedure.

The treatment was separated into three phases indicating change of wires only four times. The treatment goal was obtained with a segmented approach without any jiggling and any detectable side effects.

Had the general dentist fulfilled the patient's primary requirements, the replacement of the missing tooth, the patient would have been left with an increasing overjet and gingival impingement in addition to a forced bite related to the scissor bite, i.e. a degenerating dentition with a malocclusion that would aggravate with time and thereby be incompatible with the maintenance of a permanent dentition characterised by satisfactory function and aesthetics. Performing prosthodontic replacement of the missing tooth, even on the patient's request without establishment of an occlusion compatible with optimal function and periodontal maintenance cannot be considered "lege artis". Increased information to both patients and dentists should aim to a better understanding of the importance of the establishment of a functionally balanced occlusion before suggesting major or even minor reconstructions. The teaching in orthodontics for general dental students is in many schools being reduced with the excuse that orthodontics is a specialty. It has been argued that general dentists should not be encouraged to perform treatments for which they are not qualified. On the other hand, it is important that the general dental education is tailored for interdisciplinary treatments, thus making it clear how the different disciplines have to interact in order to serve the patients' best. Knowing when and where to refer a patient is the virtue of any family doctor and the approach can be transferred directly to the dental world. Neglecting one or the other aspect will always reduce the patients' possibility for optimal care.

Fig. 8 – Post treatment status.

Conflict of interest

The authors have reported no conflicts of interest.

Riassunto

Il presente case report è volto a descrivere la situazione tipica di un paziente adulto che richiede la sostituzione di un elemento dentale mancante ma chiede anche informazioni riguardo alla possibilità di un ripristino dell'occlusione originale, così come il paziente la percepisce sulla base di alcune foto di famiglia. In questo contributo si sottolinea l'importanza della comunicazione riguardo alle conseguenze che possono verificarsi quando si segue ciecamente la richiesta del paziente di sostituzione di un elemento dentale assente rispetto ad altre alternative che il trattamento ortodontico può offrire. Viene messo in evidenza il ruolo significativo di una comunicazione di alto livello riguardo alle alternative di trattamento nell'ambito della formazione universitaria.

Questo contributo illustra la logica su cui si fonda la suddivisione del trattamento in fasi distinte in base ai problemi specifici da risolvere e dimostra che la suddivisione in fasi riduce al minimo il tempo alla poltrona nonché la durata del trattamento.

Résumé

La présente étude de cas a l'objectif de décrire la situation typique d'un patient adulte qui va chez son dentiste et demande le

remplacement d'une dente manquante, mais aussi des informations concernant la possibilité de revenir à l'occlusion originale, comme le patient la perçoit sur la base de photos de famille. Nous soulignons l'importance de la communication rattachées aux conséquences qui pourraient se produire si l'on suit aveuglement ce que demande le patient (remplacement d'une dent manquante) face à d'autres alternatives que le traitement orthodontique offre.

Nous soulignons l'importance de conserver un haut niveau d'information sur les alternatives de traitement dans le cadre de la formation universitaire.

Nous démontrons la logique sur laquelle repose la division du traitement en phases séparées conformément aux problèmes spécifiques à résoudre et aussi que cette démarche réduit le temps au fauteuil et de traitement.

Resumen

El objetivo del presente caso de estudio es describir una situación típica de un paciente adulto que acude al odontólogo para la reposición de un diente faltante, pero también para pedir información acerca de la posibilidad de volver a la oclusión original como la percibe el paciente, basándose en algunas fotos de familia. Se subraya la importancia de la comunicación en cuanto a las consecuencias que podrían producirse de seguir ciegamente la petición del paciente de reponer un diente faltante frente a las posibles alternativas de tratamiento ortodóntico.

Se destaca el sentido de seguir teniendo un alto nivel de información acerca de las posibilidades de tratamiento en la formación de pregrado.

Se demuestra la lógica en que se asienta la división del tratamiento en fases separadas con vistas a solucionar problemas específicos y a reducir el tiempo de sillón y de tramiento.

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