The interdisciplinary treatment of congenitally missing lateral maxillary incisors by canines substitution

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ABSTRACT: Agenesis of the maxillary lateral incisors is a common finding with esthetic and functional problems. The treatment options available are space closure by canine substitution and space opening for future prostheses. The aim of this study was systematized knowledge regarding interdisciplinary treatment of lateral incisors hypodontia by canines mesialization. the position normally occupied by the maxillary lateral incisor and then reshaping it to look more like the lateral incisor.

Keywords: Hypodontia, multidisciplinary treatment, canine mesialization

I. INTRODUCTION

Hypodontia is the absence at least one of the permanent tooth in the maxilla or mandible. The incidence of hypodontia involving lateral incisors is 1-4% (1,2). Tooth agenesis of permanent teeth in the Polish population is 9.5-14.8% (3,4). Forty six percent cases of hypodontia involve lateral maxillary incisors (3). Congenital tooth agenesis can be a genetically determined and arises as a familial condition. Vieira concluded in his research that the mutation of TGFA gene may have some impact in the occurrence of hypodontia involving incisors (5). Tooth agenesis is more commonly bilateral. Missing permanent incisors should be confirmed radiological in case where they have not appeared to the age of 9, or 6 months after eruption of the contralateral tooth (6). The treatment of maxillary incisors agenesis presents a significant esthetic challenge and requires interdisciplinary approach. Various treatment options are available for patients with maxillary lateral incisors agenesis. These options include the canine substitution and subsequently correction its shape and color or space opening for prosthetic replacements or implant placement. The type of treatment depends on the patients age, motivation and attitude toward orthodontic treatment. Equally important are the skeletal growth pattern, the type of malocclusion, number of missing teeth, the size and shape of canines, as well as the gingival margin of the anterior segment of the maxilla (7,8).

There are multiple options when treatment planning these patients.6 One option is to close the lateral incisor space by moving the canine until it is adjacent to the central incisor and then reshaping it to look like the lateral incisor through a process called canine substitution. The other option is to place the canine at its natural position within the dental arch, filling the void left by the missing lateral incisor with either a single-tooth implant or a tooth-supported restoration.[5]

A thorough diagnostic protocol should be used in determining which option is best for each patient.[6] Many articles have been written suggesting that there are certain dental and facial criteria that should be analyzed before deciding which option to choose. They include malocclusion, amount of crowding, profile, canine shape and color, and level of the lip. Another criteria to consider, that isn't mentioned often in the literature is the position in the dental arch where the canine erupts.[6]

A recent study by Rendon found that when the permanent maxillary lateral incisor was missing, the canine erupted in a more mesial position within the dental arch closer to the midalveolar plane[3]. Araujo also suggests that in patients with congenitally missing maxillary lateral incisors, canines frequently show a mesial pattern of eruption, with a final position in the dental arch that is adjacent and parallel to the central incisors, and that such a condition favors canine substitution.[7]

In patients that are congenitally missing maxillary lateral incisors, one more criteria to consider that isn't mentioned in the literature is the gingival margin of the maxillary canine that erupts into the space normally occupied by the maxillary lateral incisor, and its relationship to the gingival margin of the maxillary central incisor. Is the relationship between the gingival margins like a normal maxillary central incisor/maxillary canine relationship, where the gingival margins are at the same level? Or, is the relationship between the gingival margins of the maxillary central incisor and canine more like a maxillary central incisor/maxillary lateral incisor relationship, where the lateral incisor gingival margin in more incisal than the gingival margin of the maxillary central incisor?[8.9]

Treatment planning for these patients can be challenging. There are many concerns one needs to be aware of when planning these cases because the congenital absence of one or both of these teeth introduces an imbalance in maxillary and mandibular dental arch lengths in the permanent dentition. The most predictable way to achieve the optimal esthetic and functional result is to use an interdisciplinary team consisting of a general dentist, orthodontist, periodontist, oral surgeon, and prosthodontist. Together, they should elaborate and create the patient's treatment plan and communicate throughout the course of treatment to make sure that all aspects of treatment are considered and the overall treatment objectives are achieved. [8.9.10]

There are multiple options that exist for treating these patients. The space sometimes closes spontaneously. If not, the space can be closed orthodontically through a process called canine substitution. This is done by moving the maxillary canine into the position normally occupied by the maxillary lateral incisor and then reshaping it to look more like the lateral incisor. The other option is to place the canine at its normal position within the arch, creating space for either a single-tooth implant or a tooth-supported restoration.[11,12]

When deciding which treatment option to use, primary consideration should be given to the least invasive option that conserves tooth structure and satisfies the expected esthetic and functional objectives. Whichever option is chosen, it is important to complete a diagnostic wax-up. This helps the interdisciplinary team evaluate the final occlusion and determine if an esthetic final result is obtainable.[13]

There are two principal types of malocclusion that allow for canine substitution to occur. The first one is an Angle Class II malocclusion with no crowding in the mandibular arch indicating that no extractions are necessary. This scenario would leave the molars in Class II. The second one is an Angle Class I malocclusion with enough crowding in the mandibular arch indicating that extractions are necessary. In these cases, the molar relationship would be Class I.[4,7,8,9]

The shape and color of the canines are also important factors to look at before deciding upon canine substitution. The canine is a significantly larger tooth than the lateral incisor, and its buccal surface is more convex. Because of this size discrepancy, an anterior tooth size excess in the maxillary arch would be created and anatomical adjustment must be performed to reduce the discrepancy and to establish an anterior occlusion with a normal overbite and overjet relationship.[14]

If the patient's lip level when smiling is in a position that allows the gingival margins to be visible, the gingival margin of the canine should be placed 0.5 - 1.0 mm incisal to the gingival margin of the central incisor. Also, according to Senty, if the patient has a high smile line, a prominent canine root eminence could generate an esthetic concern.[9,10]

An advantage of closing space by canine substitution is the permanence of the final result, eliminating the need for long-term temporary restorations that are often needed until the patient is old enough for a permanent prosthesis, and avoiding the long-term maintenance required for the prosthesis over the patient's lifetime which can be costly. Multiple clinicians have found that patients who had canine substitution were also healthier periodontally than those who had a prosthesis placed. And some studies have shown that patients who had canine substitution were more satisfied with the appearance of their teeth than those who had a prosthesis placed.

The disadvantages of canine substitution include the need to remove tooth structure on the canine and first premolar, and potential additional expenses if the canines need cosmetic bonding to improve the esthetic result[11,15]. Robertsson and Mohlin found in their study that patients who had canine substitution were dissatisfied with the lack of color balance of the maxillary canine and the adjacent teeth.[16]

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II. MATERIAL AND METHODS

The patient presented at the age of 15 years for a consult for orthodontic treatment in anterior teeth. She is disturbed of the unsatisfactory aesthetic Situation in the anterior maxillary teeth. The lateral Incisors were missing. As A Result of the long period of time between the eruption of teeth 13 and 23 and the day of consult, both teeth were mesially drifted to the physiological place of both lateral incisors. The teeth 13 and 23 erupted mesial to their physiological eruption place and thus took the place of the missing lateral Incisors. Teeth 12 and 22 were missing, which bothered the patient the most. The profile is harmonic in both the sagittal as well as in the vertical dimension.

The intra-oral images show the beginning of the treatment, an Angle Class I occlusion of the first molars on both sides **FIG 1a- c** In a frontal image, the canines are at the position of the lateral incisors. The gaps for the missing lateral incisors are closed. In the upper arch there are rotations of the premolars both right and left. In the Lower arch crowding exists, about a 7mm. The periodontal situation was good as clinically seen. **FIG 2a- b** The Panoramic X-ray shows the presence of all teeth except for the both lateral incisors. The periodontal situation was radiographically good and the Bone condition shows that there are no Periodontal Disease (**FIG 3**). The cephalogram shows no skeletal Abnormalities. The anterior maxilla is in normal axis, while the anterior mandibular teeth were retroclined (**FIG 4**).

III. RESULTS

To produce a seamless, aesthetically pleasing maxillary arch there are two alternatives:

1. Non-extraction therapy: gap opening for the prosthetic replacement of 12 and 22. The necessary space for harmonious formation in the maxillary dental arch is obtained by conservative-space gaining.

2. Extraction therapy and Orthodontic space closure:

Positioning of the canine teeth in place of the lateral incisors. This approach requires a balancing extraction of two premolars in the mandible. The parents of the patient were alerted of the advantages and disadvantages of both alternatives discussed. They ultimately chose for the extraction therapy in the mandible and close the gap in the upper jaw.

In the orthodontic phase, a fixed appliance $(0.022 \times 0.028 \text{ slot backets})$ was bonded for the planned tooth movements. In the lower jaw, the teeth 34 and 44 were extracted as a place for obtaining the resolution of crowding.

Before the debonding of the MB apparatus an interdisciplinary discussion with the attending colleagues, shape change of the canines was performed to lateral incisors and their characteristics.

After twelve months of orthodontic treatment all objectives were achieved. The arches were formed. The overjet in the sagittal and vertical dimension was in the physiological range (FIG 5a-e)

The cephalogram (**FIG 6**) shows the dental changes; due to the slight retrusion of the fronts in both jaws, there was a relatively small, lingual tipping of both fronts. The Panoramic X-ray shows no abnormalities, and no root resorption were recorded (**FIG 7**).

To improve the dentofacial aesthetics in the anterior region, the shape of the canines was changed to lateral incisors with composite (**FIG 8a-c**) For retention we bonded a fixed Retainer in the mandibular arch from canine to canine. In addition, retention plates were used in the maxilla and mandible.

IV. DISCUSSION

There are two treatment methods of patients with hypodontia of the second incisors. The first method is opening the space for prosthetic restoration or implant placement. The second method is closing the space and substitution incisors by the canines. Key role in creating and setting the appropriate space for missing lateral incisors in the maxilla plays orthodontist. The rule of the Divine Proportion by

Fibonacci defines the size of the space needed for the missing later incisor (12). This means that when looking straight at the arch, beginning from the central incisor, each following tooth should constitute 61.8% the preceding. In patients with lateral incisors hypodontia, closing of the space should be done keeping in mind patient's profile, the type of malocclusion, severity of teeth crowding, lip line, color and shape of canines (7,14,15). The final decision of the treatment is based on the diagnostic wax set-ups. The ideal profile for space closure is the patient having a straight harmonic profile. Gently convex profile is equally suitable for this treatment method. However, patients with concave profile, deficiency of subnasal area and lack of the chin are not good candidates for space closure. In those cases, the treatment method is best selected, not by the type of malocclusion, but rather by facial profile (14,15).

There are two types of malocclusion which allow for safe space closure: malocclusion Angle Class II without crowding in the lower arch, where molars exhibit Angle

Class II dental relationship and first premolars are in Canine Class I. The other alternative is Angle Class I dental relationship with crowding which requires extractions in lower arch (14,15,16,17,18). The shape and color of canines significantly affects the facial esthetic of the patient following the orthodontic treatment. Canine is significantly larger than lateral incisor, with the wider crown and convex labial surface (15,18,20). Zachrisson's opinion is that flattening of the labial surface of canine can be delayed until the end of orthodontic treatment, which allows for better maintenance of bracket to the tooth during orthodontic treatment. In Parks opinion flattening of the labial surface of the canine is better before placing the bracket (16). Labial surface of the canine should be grinded with careful due to the possibility of color change to more yellow or gray.[18,19.20]

Naturally, canines are darker than lateral incisors, and grinding deepen the color disproportion. Dentin begins to show through the thin layer of enamel worsening the cosmetic effect (15,18,20,21,22,23). In those cases, most reasonable treatment method is tooth whitening (21).

In patients with a gingival smile, it is particularly important to pay attention to the esthetics and the course of gingival margin over the substituted teeth (15). This concerns both the canines replacing the lateral incisors, and the first premolars replacing the canines. Gingival margin of the central incisor is at the highest level. The level of gingival margin above the lateral incisor is about 1,5mm lower, and the level of gingival margin above the canine runs the same course as that of the medial incisor. It is important when replacing lateral incisors with canines, because otherwise the effect will not be natural [24,25]

The best esthetic effect is accomplished when the gingival margin at the lateral incisor is in shape of a symmetric half oval or half circle, and the gingival margin around the upper central incisor and canine are elliptical and pointed backwards to the long axis of the tooth. In the case of central incisors and canines, the most apically directed tip of gingival margin should be located to the back of the long axis of the tooth, and in the case of lateral incisors it should lie in that axis (13).

When planning the replacement of the lateral incisor, the canine should be orthodontically extruded with its gingival margin (15). The purpose of this procedure is to mask the substituting canine. Patients with high line of smile and thin gingival biotype can sometimes have a visible root prominence of the canine which presents an additional esthetic problem. First premolar replacing the canine can cause a disturbance in the esthetics of gums, due to the naturally lowering course of gingival margin (16). If such result is not acceptable for the patient, the crown of the premolar can be surgically extended, consequently placing a porcelain veneer over it. This way, we preserve the ideal coronal length and the course of gingival margin (16). Contact surface is the space in which teeth adjacent to each other. The height of the plane is biggest between central incisors and decreases gradually in the direction of lateral tooth.[26,27]

The places of contact between maxillary teeth are displaced upward starting from the central incisors to premolars. Contact planes that are too short cause the formation of so called black triangles, which occur when the gingival spaces are not filled with gingival papilla (13). By evaluating the anterior width of teeth we can see that the canine is wider than the later incisor by an average of 1,2mm (17). This means, that its size on the contact surface should be decreased by grinding, and the width of the future lateral incisor should be determined by factors such as the size of the central incisor and diagnostic wax set-up (16). Canine reduction in contact surface can be done during one visit, best at the beginning of orthodontic treatment. In cases where canines are in contact with adjacent teeth, grinding of the contact surface can be delayed until the contact surface become more available, such as during the orthodontic treatment, after the adjacent teeth have been spread apart. In case of canines with a more convex labial surface, grinding of the labial surface can expose dentin.[28,29.30]

In such cases it is necessary to rebuild the surface using hybrid composite resin or porcelain veneers (22,23,24). Minimally invasive technique should be employed

when grinding canines, using diamond drills and water cooling. Zachrisson showed that when using diamond drills and water cooling, increased tooth sensitivity is avoided. This concerns patients in the developmental age, whose teeth have a wide tooth chamber, as well as adult patients. Sometimes, grinded teeth become more sensitive to temperature changes, which usually pass three days after the procedure. Following the grinding, the surface of the crown should be polished with paper discs or paste with pumice, finishing the process with the application of fluorine (23).

In cases of high clinical crown, grinding of the incisal edge should be performed as well as grinding of the enamel from the palatal surface of canine. To eliminate traumatic occlusion of the mandibular lateral incisors with the ingual surface of the canines, the lingual cusps of the maxillary canines and first premolars have to be contoured. However, in cases of short clinical crowns, it is better to build the incisal edge mesially and distally to its cusp, reconstructing the contact surface and incisal edge. The ideal substitution for incisor is a canine with a narrow mesio-distal width of enamel-cement junction.[24,25,26]

This width can be evaluated radiological before the start of the treatment. Canine with a narrow mesiodistal width in the place of enamel-cement junction gives a better esthetic effect than a canine with a wide cervix (15). The ideal substitution for the incisor is a canine of the same color as the central incisor, narrow in the place of enamel-cement connection, both on the lingual and mesio-distal surface, having a flat labial surface. When replacing lateral incisors with canines, we should remember to place a bracket from lateral pacjenincisor to the canine, placing it distally to the tooth axis, obtaining a mesial rotation of the canine together with its largest convexity which assimilate it to lateral incisor (16). Brackets for canines should be placed to

first premolars distally to the axis rotate them mesially, to obtain a better contact between the future canine and the future lateral incisor. Additionally, it covers the flat mesial surface of the premolar, giving it a more convex profile (16,24.29).

First premolars should be extruded to the contact with contrary teeth, and palatal cusp should be grinded. Palatal cusps of premolars can block the lateral mandibular movements, and should be grinded to make lateral movements possible (16). Following the alignment of teeth and change the shape of canines, there is often a need to rebuild the hard tissues of the canine, to give the proper color and shape of the lateral incisor. This is achieved by whitening, hybrid composite resin fillings or porcelain veneers (22,23,24,30). Treatment of choice should be a conservative method which meets the esthetic demands of the patient. Touverson pointed out that canines have similar color same as adjacent teeth, and present more harmoniously than prosthetic porcelain replacements (9). Nordquist and McNeill conducted a study where they examined the periodontal condition of patients treated orthodontically. They examined two groups of patients: 39 were treated by closing the space created by missing lateral incisors, and 19 patients were treated by restoring the space for incisors by prosthetic restorations.

Their study showed that patients treated with space closure had significantly healthier periodontal condition compared to those who had prosthetic restoration of lateral incisors (30,31,32). Robertsson and Mohlin conducted a similar study and showed that patients treated by space closure were more satisfied with the end result than those having prosthetic replacements. Patients with prosthetic restorations had more plaque and the accompanying gingivitis (11). The conclusion from the studies is that patients who possess natural teeth have a healthier periodontal condition and are more satisfied with the end result of the treatment, compared to patients with prosthetic restorations.

V. CONCLUSIONS

Orthodontic space closure is a valid treatment option in cases of congenitally missing maxillary lateral incisors and depends on the evaluation of profile, state of occlusion, and the available space.

- Mildly convex profile
- Class II malocclusion
- A tendency towards maxillary crowding in a patient with
- a well-balanced profile and normally inclined anterior teeth
- Marked maxillary crowding or protrusion
- Canines and premolars of similar size
- Dentoalveolar protrusion

It is important that the orthodontist together with the other specialists frame a treatment objectives which are realistic and meet the needs of the patient. Constant interaction and communication among the team members and the patient at all level of treatment are the keys to the success of the interdisciplinary treatment.

REFERENCES

- [1]. Abu-Hussein M, Watted N, Yehia M, Proff P, Iraqi F (2015) Clinical Genetic Basis of Tooth Agenesis. J Dent Med Sci 14: 68-77.
- [2]. Muhamad Abu-Hussein, Nezar Watted, Abdulgani Azzaldeen, Mohammad Yehia, Obaida Awadi, et al., (2015) Prevalence of Missing Lateral Incisor Agenesis in an Orthodontic Arabs Population in Israel (Arab48). Int J Public Health Res. 3(3): 101-107.
- [3]. Abu-Hussein M, Watted N, Abdulgani A, Borbély ; Modern Treatment for Congenitally Missing Teeth: A Multidisciplinary Approach. Int J maxillofacial res2015, 1: 179-190.
- [4]. Nezar Watted ,Abdulgani Azzaldeen ,Muhamad Abu-Hussein; AESTHETIC REPLACEMENT OF CONGENITALLY MISSING TOOTH USING FIBER-REINFORCED COMPOSITE (FRC) Int J Dent Health Sci 2014; 1(4): 644-653
- [5]. Vieira AR, Meira R, Modesto A i wsp. MSX1, PAX9, and TGFA Contribute to Tooth Agenesis in Humans. J Dent Res 2004; 83: 723-7.
- [6]. Abu-Hussein M, Abdulgani A, Watted N, Zahalka M ; Congenitally Missing Lateral Incisor with Orthodontics, Bone Grafting and Single-Tooth Implant: A Case Report. J Dent Med Sci 2015,14: 124-130.
- [7]. Kinzer GA, Kokich VO. Managing congenitally missing lateral incisors. Part II: tooth-supported restorations. J Esthet Restor Dent 2005; 17: 76-84.
- [8]. Saud A. Al-Anezi. Orthodontic treatment for a patient with hypodontia involving the maxillary lateral incisors. Am J Orthod Dentofac Orthop 2011; 139: 690-7.
- [9]. Tuverson D. Close space to treat missing lateral incisors. Am J Orthod Dentofac Orthop 2004; 125: 17A.
- [10]. Nordquist G, McNeill R. Orthodontic vs. restorative treatment of the congenitally absent lateral incisor long term periodontal and occlusal evaluation. J Periodontal 1975; 46: 139-43.
- [11]. Robertsson S, Mohlin B. The congenitally missing upper lateral incisor. A retrospective study of orthodontic space closure versus restorative treatment. Eur J Orthod 2000; 22: 697-710.
- [12]. Muhamad AH, Watted N, Proff P, Borbély P, Watted A (2017) Implant for Congenitally Missing Maxillary Permanent Cuspid. Int J Dentistry Oral Sci. 4(5), 471-475.
- [13]. Kokich VG, Nappen DL, Shapiro PA. Gingival contour and clinical crown lenght: their effect on the esthetic appearance of maxillary anterior teeth. Am J Orthod 1984; 86: 89-94.
- [14]. Sabri R. Management of missing maxillary lateral incisors. J Am Dent Assoc 1999; 130: 80-4.
- [15]. Nezar Watted , Péter Borbély Ali Watted * , Ghannam Nidal , Abdulgani Azzaldeen ,,Muhamad Abu-Hussein; Combined orthodontic and prosthetic therapy ; Special considerations Journal of Dental and Medical Sciences 2016, 15, 12,62-73
- [16]. Abu-Hussein M, Watted N, Hegedus V, Péter B (2015) Congenitally Missing Upper Laterals. Clinical Considerations: Orthodontic Space Closure 1: 1-6.
- [17]. Abu-Hussein M, Watted N, Abdulgani A (2016) Managing congenitally missing lateral incisors with single tooth implants. Dent Oral Craniofac Res 2: 318-324.
- [18]. Armbruster P, Gardiner D, Whitley J i wsp. The congenitally missing maxillary lateral incisor. Part 1: esthetic judgment of treatment options. World J Orthod 2005; 6: 369-75.
- [19]. Armbruster P, Gardiner D, Whitley J i wsp. The congenitally missing maxillary lateral incisor. Part 2: assessing dentists' preferences for treatment. World J Orthod 2005; 6: 376-81.
- [20]. Rosa M, Zachrisson B. Integrating esthetic dentistry and space closure in patients with missing maxillary lateral incisors. J Clin Orthod 2001; 35: 221-34.
- [21]. Rosa M, Zachrisson B. Integrating esthetic dentistry and space closure in patients with missing maxillary lateral incisors: further improvements. J Clin Orthod 2007; 41: 563-73.
- [22]. Rosa M, Zachrisson B. The space-closure alternative for missing maxillary lateral incisors: an update. J Clin Orthod 2010; 44: 540-9.
- [23]. Zachrisson BU, Rosa M, Toreskog S. Congenitally missing maxillary lateral incisors: canine substitution. Point. Am J Orthod Dentofacial Orthop. 2011;139:434–445.
- [24]. Muhamad Abu-Hussein et al, Congenitally Missing Lateral Incisors; Orthodontic, Restorative, and Implant Approaches. Int J Dent and 2:3, 71-81
- [25]. Abu-Hussein M., Watted N., Abdulgani M., Abdulgani Az; Tooth Autotransplantation; Clinical Concepts Journal of Dental and Medical Sciences2016, 15 (7) 105-113 DOI: 10.9790/0853-15078105113
- [26]. Nezar Watted ,Abdulgani Azzaldeen ,Muhamad Abu-Hussein; AESTHETIC REPLACEMENT OF CONGENITALLY MISSING TOOTH USING FIBER-REINFORCED COMPOSITE (FRC) Int J Dent Health Sci 2014; 1(4): 644-653

- [27]. Abu-Hussein M, Chlorokostas G, Watted N, Abdulgani A, Jabareen A ; Pre- Prosthetic Orthodontic Implant for Management of Congenitally Unerupted Lateral Incisors – A Case Report. J Dent Med Sci 2016,15: 99-104.
- [28]. Abu-Hussein M, Watted N ;Maxillary Midline Diastema Aetiology And Orthodontic Treatment-Clinical Review. J Dent Med Sci2016, 15: 116-130
- [29]. Abu-Hussein Muhamad1, Abdulgani Azzaldeen2, Watted Nezar; Single Visit Replacement of Central Maxillary Using Fiber-Reinforced Composite Resin. Journal of Dental and Medical Sciences 2017, 16, 3, 69-74
- [30]. Muhamad AH, Azzaldeen A (2012) Autotransplantation of Tooth in Children withMixed Dentition. Dentistry 2: 149.
- [31]. Abu-Hussein M, Watted N, Abdulgani M, Abdulgani Az (2016) Tooth Autotransplantation; Clinical Concepts. J Dent Med Sci 15: 105-113.
- [32]. Abu-Hussein M, Watted N, Abdulgani A (2015) Autogenous Tooth Transplantation -Reality Or Not. Int J Dent Health Sci 2: 722-730

LEGENDES

Fig 1a-c; Agenesis of teeth 12 and 22 with significant crowding in the mandibular arch. Gap opening for the missing teeth is hardly possible with simultaneous resolution of crowding in the lower jaw. The almost closed gaps for the lateral incisors orthodontic be closed, so that the teeth 13 and 23 are positioned at the location of the missing teeth. In the lower jaw the teeth 34 and 44 extracted in return.



Fig 2a-b; Maxillary view, Mandibular view



Fig 3: All teeth are present, with the exception of 11 and 12.



Fig 4: cephalogram prior to treatment



Fig 5a-e: Fig a-c. Intraoral photographs in occlusion. There are Class I occlusion of the 6 with physiological overjet and overbite



Fig d, e:. Canines at the position of the lateral incisors and before the change of theshape



Fig 6: Panoramic after the treatment



Fig 7: Cephalogram after the treatment



Fig 8a-c: The intra-oral images show the situation after the end of treatment



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