Evaluation of maxillary protrusion malocclusion treatment effects with prosth-orthodontic method in old adults

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Purpose: To evaluate the treatment effects of maxillary protrusion malocclusion with prosth-orthodontic method in old adults, which is a combined use of prosthodontics and orthodontics.

Materials and Methods: Totally 18 cases were treated by prosth-orthodontic method, including 16 females and 2 males, average 45.6 years in age. Cephalometric analysis was applied to evaluate the treatment effects. Angle and liner changes of pretreatment and post-treatment were determined and the results were analyzed by Student tests ($p<0.05$).

Results: Compared with pretreatment and post-treatment by prosth-orthodontic method, the angle changes were significantly different in the measurement of U1-FH ($p<0.05$) and II ($p<0.01$), and the linear changes were significantly different in the measurement of OB ($p<0.05$), OJ ($p<0.01$), Uls-AB ($p<0.01$), LLs-AB ($p<0.05$), Bs-AB ($p<0.05$), and C-St ($p<0.05$). After the prosth-orthodontic treatment, the angle of upper and lower incisors were changed to normal, the overbite and overjet were reduced to normal.

Conclusion: Prosth-orthodontics is an effective method for old adults. **(Int Chin J Dent 2003; 3: 76-81.)**

Clinical Significance: The results of the current study demonstrate that the prosth-orthodontics is an effective method for old adults, especially for those who are not suitable for orthodontic treatment cases.

Key Words: cephalometric analysis, maxillary protrusion, orthodontics, prosthodontics, proth-orthodontics.

Introduction

Maxillary protrusion is a comparatively common kind of malocclusion in clinic.[1,2] The marked labially proclination of upper incisors would cause gummy smile and disharmony of soft tissue profile in lips region, affecting the esthetics in facial side appearance and even bringing some psychological problems.[3-5] However, the intraoral condition in middle age cases with maxillary protrusion malocclusion is completely different from those in children and adolescence. Lack of dental health care, the intraoral condition in middle age cases is poor after many years of use, especially in dental malalignment cases. The concomitant severe odontal diseases, periodontal diseases and dental misposition would bring a great many difficulties to routine orthodontic treatment, some of which could not been orthodontically treated. In addition, many of middle age cases would not accept the orthodontic treatment wearing fixed appliances for a 1-2 years of period because of professional or social reasons. So in our clinic practice, the middle age cases with severe

anterior crowding were treated with porcelain prosthesis to re-align the anterior teeth, and the results were satisfactory. The purpose of this study was to evaluate the efficacy of orthodontic prosthesis applied in 18 maxillary protrusion malocclusion cases in old adults.

Materials and Methods

Procedures of Prosth-orthodontics

Odontal diseases and periodontal diseases should be perfectly treated after routine dental examination (including panoramic films and cephalometric films). Two sets of models for each subject were used, one for comparison before and after treatment as study model, the other one for tooth alignment experiment transferred to dental articulator as work model in order to confirm the prosth-orthodontic design. Porcelain prosthesis procedures were performed including root canal therapy, tooth preparation, getting work model for porcelain prosthesis, temporary dummy making, dental color blending, finishing porcelain prosth-orthodontic appliances and clinical insertion. Cephalometric films and study models were taken after prosth-orthodontic treatment.

Measurements

Measurement Landmarks: There were 14 landmarks used in this study (Fig. 1), including Porion (P), Orbitale (Or), Pogonion (Po), Menton (Me), Gonion (Go), Upper Incisor (UI), Lower Incisor (LI), Upper Labrale (ULs), Lower Labrale (LLs), Subspinale (A), Supramental (B), Supramental of soft tissue (Bs), Pogonion of soft tissue (Pos), Stomion (St).

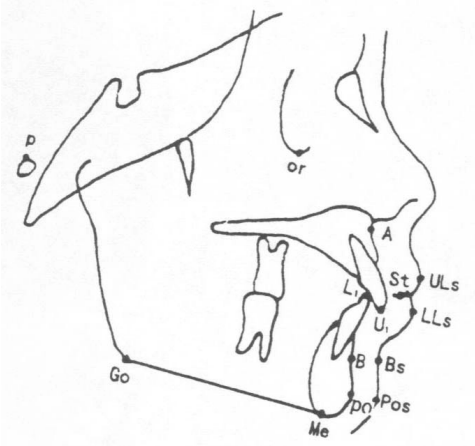

Fig. 1. Measurement landmarks.

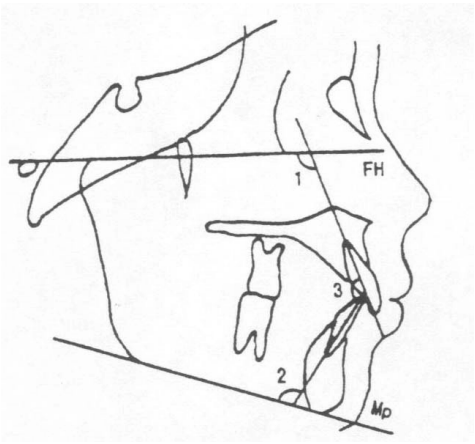

Fig. 2. Angle measurements.

Angular Measurements: There were 3 angular measurements (Fig. 2) analyzed, including angulation of upper incisors (UI-FH) defined as inferioposterior angle formed by the intersection of upper incisor axis and Frankfort horizontal plane, angulation of lower incisors (LI-MP) defined as superioposterior angle formed by the intersection of lower incisor axis and mandibular plane, inter-incisal angle (II) defined as

posterior angle formed by intersection of upper and lower incisor axis.

Linear Measurements: There were 8 linear measurements (Fig. 3) analyzed. Horizontal distance measurements: ULs-AB, LLs-AB, Bs-AB, Pos-AB defined as lines separately drawn from points ULs, LLs, Bs, Pos perpendicular to the line connecting point A and point B. Vertical distance measurements: St-C defined as the distance from the point C (the intersection point of UI-A and palatal plane) to the corresponding point of St (the intersection point of a line drawn from St perpendicular to UI-A), representing the length of upper lip. St-D defined as the distance from the point D (the intersection point of LI-B and mandibular plane) to the corresponding point of St (the intersection point of a line drawn from St perpendicular to LI-B), representing the length of lower lip. Overbite (OB): the vertical distance from UI to LI. Overjet (OJ): the horizontal distance from UI to the labial surface of lower incisors.

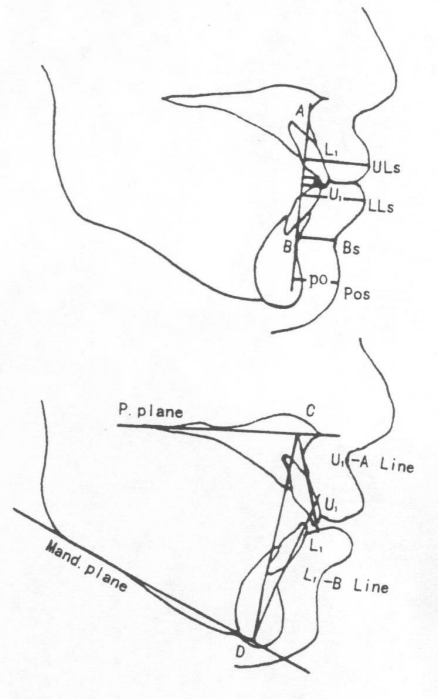

Fig. 3. Linear measurements.

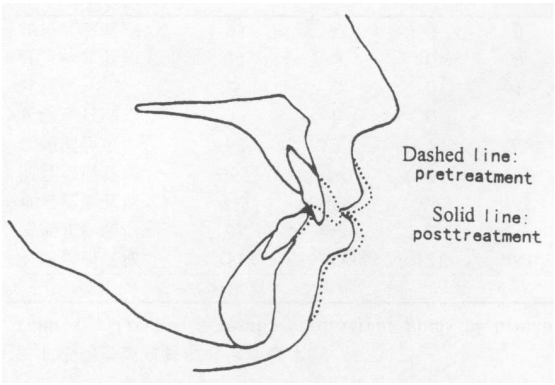

Fig. 4. Superimposition of pretreatment and post-treatment cephalograms.

Data Collection and Statistical Analysis

After X-ray films tracing and measurements in a continuous period, Student test was applied to analyze the data of pre- and post-treatment by using SAS statistical software in computer.

Results

Angular Changes before and after Treatment

They were shown in Table 1. There were statistically significant differences in the angulation of U1-FH and II before and after treatment. No significant difference was found in the angulation of L1-MP.

Table 1. Angle changes of pretreatment and post-treatment.

Measurement	Pretreatment	Post-treatment
U1-FH	112.5 ± 7.21	94.8 ± 6.54 (1)
L1-MP	97.2 ± 6.47	97.2 ± 6.47
H	102.8 ± 8.13	119.3 ± 8.97 (1)

1) $p<0.01$

Linear Changes before and after Treatment

They were shown in Table 2. There were statistically significant differences in ULs-AB, OJ, LLs-AB, OB and St-C. No significant difference was found in St-D.

Table 2. Liner changes of pretreatment and post-treatment.

Measurement	Pretreatment	Post-treatment
OB	5.01 ± 1.21	4.65 ± 1.34 (2)
OJ	13.02 ± 2.35	4.72 ± 2.17 (1)
ULs-AB	27.61 ± 5.13	21.82 ± 4.98 (1)
LLs-AB	25.83 ± 4.82	21.43 ± 3.97 (2)
Bs-AB	18.40 ± 3.13	16.11 ± 2.79 (2)
Pos-AB	17.23 ± 3.12	17.23 ± 3.12
C-St	33.50 ± 7.64	31.30 ± 6.42 (2)
D-St	51.21 ± 9.71	52.41 ± 10.49

1) $p<0.01$, (2) $p<0.05$

Superimposed Cephalometric Changes before and after Treatment

The superimposed cephalometric tracing before and after treatment (Fig. 4) showed clearly that, with the marked lingual replacement of upper incisors and length adjustment of the clinical crowns, the relationships of overbite and overjet in anterior region were significantly proved, also the soft tissue profile in lips region was changed from notable protrusion before treatment to a more harmonious and esthetic appearance. Tables 1 and 2 showed the decrease of UI-FH from 112.5 degrees before treatment to 94.8 degrees indicating the significant lingual proclination of upper incisors, the decrease of anterior overjet by 9 mm and the increase of II from 102.8 degrees before treatment to a more suitable 119.3 degrees resuming the normal occlusal induction in anterior movement to some extent and its indirect protective effects on TMJ.

Discussion

Indications

With the raise of community total standard of living, the average life in Chinese population had been obviously prolonged. The more intensely pursuing health and esthetics, the more understanding the importance of dental functions. Intraoral diseases in adults (including periodontal diseases, dental caries, tooth missing and occlusal disturbance) become more severe in middle age period, so the demand for comprehensive dental treatment including orthodontic treatment comes to grow up considering functions and esthetics. However, the middle age patients we met in clinic have ignored the dental health care for a long time, as a result, their crowding and protrusion malocclusion affecting the normal profiles often go with the severe peridentitis (notable absorption in alveolar bone), wedge-shaped defect, severe odontal diseases, attrition of tooth, root exposure due to gingival atrophy, dead tooth and defect of dentition. Such

intraoral condition would bring a great many difficulties to routine orthodontic treatment, some of which could not been orthodontically treated. If this kind of middle age cases were orthodontically treated using fixed appliances, their teeth would be loosened because of too quick movement and even the periodontal tissue damaged more. In addition, many of middle age cases would not accept the orthodontic treatment wearing fixed appliances for a 1-2 years of period because of the age, the professional or the other social reasons. So the author treated this kind of patients by means of prosth-orthodontics to satisfy them, getting marked improvement both in function and in esthetics finally within a short term (3-4 weeks) without extraction, without wearing any appliances, and without affecting daily appearance.

Therefore, the indication of prosth-orthodontic treatment should be strictly and scientifically controlled. The middle age patients with dental malalignment whose intraoral condition equal to orthodontic treatment should be orthodontically treated firstly when they accepted the treatment planning. When some middle age patients with dental malalignment could not be orthodontically treated due to poor intraoral condition, or they could not accept the long-term treatment wearing intraoral appliances, prosth-orthodontics treatment would be another effective means considered of.

The Effects of Prosth-orthodontic Treatment on Hard Tissues and Soft Tissues in Maxillary Protrusion Cases

The careful dental examination should be carried first before prosth-orthodotic treatment, including analysis of dental and skeletal amount, analysis of arch length and width and cephalometric measurements. On the basis of the design philosophy of prosth-orthodontics, working models transferred to a regulable dental articulator were used to make sure the labiolingual inclination of upper and lower incisors, to confirm the vertical height and to re-align the anterior teeth relieving crowding. Eventually the normal or approximately normal relationships of overbite and overjet and the inducible occlusion during anterior movement were achieved without abnormal occlusal interferences. So the dentist and the patient would all agree with the treatment planning harmonizing the functions and esthetics.

A study by Yogosawa showed, the retrusive amount of the upper incisors had a correlation with that of the upper lip significantly in the maxillary protrusion patients before and after treatment, and with that of the lower lip to some extent. The results in our study also showed that, with the lingual replacement of upper incisors, ULs-AB distance which indicating the degree of upper lip protrusion was decreased by 5.8 mm, LLs-AB distance which indicating the degree of lower lip protrusion was decreased by 4.4 mm and Bs-AB distance indicating the anteroposterior corresponding position of supramental in soft tissue was decreased by 2.3 mm. These results were consistent with those in Yogosawa's study. In addition, St-C and St-D indicating the length of upper and lower lip respectively were changed with the labiolingual inclination and vertical position of anterior teeth, St-C decreasing by 2.2 mm and St-D increasing 1.2 mm.

Therefore, the replacement of anterior teeth led to some changes of soft tissue shape in lips region, significantly improving the protrusive profile in esthetics and resuming the occlusal inducible function in anterior movement.

Clinical Key Points of Prosth-orthodontics

Prosth-orthodontics was different from the routine orthodontics, with which we treated the patients in middle age who had odontal diseases or periodontal diseases demanding esthetical recovery urgently. Thus, in clinic, dentists should do a careful dental examination and a perfect treatment for the odontal disease or periodontal disease before the prosthorthodontic treatment for malocclusion. In order to achieve the normal relationships in anterior overbite and overjet and the harmonious profile, the dental re-alignment experiment must be done in articulator before treatment and treatment planning set. The results of dental re-alignment must be not only in accordance with dental physiology, but also reproducible exactly in patients.

Based on the above principles of treatment, the malposed teeth should be crown-cut after perfect root canal therapy. When the post was used for retention in a root canal filled teeth, the diameter of the post should be designed considering the intensity of dentinum in order to enhancing the retention and stability, avoiding dental crack. Usually the diameter of the post should be 1/3 of that of the root, and the post would has the same length as the dental crown at least. The root canal preparing for the post should be operated as carefully as possible without changing the inner anatomic structure. A metal ring could be manufactured around the post on the occlusal surface of the root protecting the root from fracture. A shoulder prepared on the occlusal surface of the root could decrease the wedge force effect leading to root crack when occlusal force pressed. In addition, when crown cutting and root inner preparing, the relationship of the labiolingual inclination of anterior teeth and the post design, as well as the accordance of prosthordontic appliances intensity with the common path of insertion should be considered enough, avoiding the anterior occlusal interference and establishing the normal occlusal inducible function in anterior movement.

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