Orthodontic treatment for maxillary anterior pathologic tooth migration by periodontitis using clear aligner

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**Purpose:** Pathologic tooth migration (PTM) is a tooth displacement which is derived from imbalance of tooth retention force and is dominantly found out in maxillary anterior area. PTM in maxillary anterior area was tried to corrected with periodontal treatment and a clear aligner in this study and the result was evaluated clinically and radiographically.

**Methods:** For the treatment of a patient with chronic periodontal disease accompanied by maxillary anterior pathologic tooth migration, clear aligner was applied to move teeth after a series of case-related periodontal therapy. Clinically, probing depth, gingival recession, clinical attachment level and mobility were measured pre- and post-treatment, and radiographic examination was performed as well.

**Results:** Clinically, we found the decrease of the probing depth, gingival recession, clinical attachment level and mobility. And we could also acknowledge the reduction of vertical and horizontal dimension on infrabony defect radiographically. However, it is still controversial if there was an actual bone filling.

**Conclusions:** Clear aligner is an effective appliance to move teeth since it costs little in terms of expense and time. In addition, it wraps whole crowns, providing advantages to deal with crowding, spacing, and size of arch. In short, clear aligner could be a useful treatment option for PTM patient, since it provides decreased probing depth, gingival recession, clinical attachment level, mobility and esthetical restoration.

**Keywords:** Chronic periodontitis, Dental esthetics, Tooth migration.

**INTRODUCTION**

Pathologic tooth migration (PTM) is tooth displacement resulting from the imbalance of tooth retention forces [1]. A variety of factors are regarded to be related to PTM, and the incidence is reported to be up to 50% of periodontitis patients [2,3]. The factors are, specifically, destruction of periodontium, inflammation in periodontal tissue, eruption force, oral habit, pressure in soft tissue, and occlusal force. Destruction of periodontium is one of the major causes of PTM, and it is known to make the incidence of PTM 3 to 8 times higher according to the amount of bone loss [2]. Inflammation in periodontal tissue increase hydrodynamic and hydrostatic forces around relevant vessels and tissues, possibly resulting in tooth displacement [4]. Eruption force may be a contributing factor, since extrusion is a common clinical feature of PTM [3]. Various occlusal factors are also related to PTM, as are oral habits such as lip and tongue habits, fingernail biting, thumb sucking, pipe smoking, and bruxism, and pressure from soft tissues like the tongue, cheek, and lips.

Treatment options for PTM are to remove causes and allow for natural healing, to provide limited additional orthodontic
treatment after extraction of migrated teeth, and to generally straighten teeth [3]. Clear aligner, which is used for additional or limited orthodontic treatment of PTM, was introduced as a gingival stimulating appliance in 1926 [5], and Kesling [6] reported it to be used for tooth movement. Clear aligner is effective since it intermittently generates 3-dimensional orthodontic force. The protocol starts with applying a 0.5 mm-thick aligner for the first week. The thickness is then increased to 0.75 mm for the next 2 weeks. This procedure relieves patients’ pain and decreases undesirable effects on the neighboring teeth with gradual teeth movement of 1 mm at each stage [7]. However, due to its elasticity and deformation, the appliance has to be remade every three weeks. Clear aligner might be indicated for a small amount (≤ 4 mm) of teeth movement, for instance, space closure, extrusion and intrusion, arch expansion and contraction, relapse of orthodontic treatment, and controlling the rotational axis of the teeth to remove crowding [8].

Ericsson et al. [9] noted that teeth movement without pre-orthodontic periodontal treatment could induce infrabony pockets since supra-gingival plaque goes under the gingiva along the movement. Wennström et al. [10] asserted that infrabony pockets would do no harm to clinical attachment if there was proper plaque control. Lindhe et al. [11] reported that orthodontic treatment after periodontal treatment can move teeth without attachment loss although it does not affect the clinical level itself in a positive way. Corrente et al. [12] wrote that an extruded tooth with an infrabony pocket showed decreased probing depth, clinical attachment gain, and bone filling radiographically after periodontal and orthodontic treatment. This study evaluates the effectiveness of periodontal treatment and a clear aligner for maxillary anterior PTM clinically and radiographically, based on the previous research mentioned above.

CASE DESCRIPTION

Subject
Three patients with chronic periodontitis and PTM who visited the Periodontal Department of the Chosun University Dental Hospital from May 2009 to July 2009 were sampled. Chronic periodontitis in the study is limited to cases accompanied by an infrabony pocket, tooth mobility ≤1°, and a sufficient amount of attached gingiva. Subjects for orthodontic treatment are defined as patients who have less than 4 mm PTM in the maxillary anterior area.

Clinical and radiographic examination
Clinical examination
The following clinical examinations were performed for the 3 patients pre- and post-periodontal and orthodontic treatment with a clear aligner.
- Probing pocket depth
- Clinical attachment gain
- Gingival recession
- Mobility

Radiographic examination
Subjects were checked to see if they had any infrabony pockets before periodontal treatment through panoramic and standard views. For the patients with an infrabony pocket, the vertical and horizontal size of the pocket was measured with the Infinitt π-ViewSTAR calipers at the Chosun University Dental Hospital Radiology System, as seen in Fig. 1. This method had been introduced by Corrente et al. previously (Fig. 1).

Treatment with clear aligner
After periodontal treatment, the clear aligner was applied. It was made on a patient’s model cast, in which teeth were aligned after space analysis so that the patient’s teeth would not be moved more than 1 mm by the appliance. Thermoplastic clear hard type (polyethylene) polymer was used with thicknesses of 0.5 mm and 0.75 mm. For the first week, a 0.5-mm-thick appliance was used, followed by a 0.75-mm-thick one for the subsequent two weeks. Patients were recalled every three weeks for new appliances. They were instructed to keep the appliance on all day long, with the exception of meal times.

Case reports
Case I
A 50-year-old male patient visited our department on July 2009.