

## REHABILITATION OF OPEN BITE WITH DIASTEMA USING ZIRCONIA CERAMIC CROWNS: CASE REPORT

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### Abstract

Open bite is a lack of vertical overlap of the anterior teeth in centric occlusion. Diastema is defined as no contacts between proximal teeth. Dentofacial discrepancies negatively affect the speech, masticatory function and aesthetics.

Where orthodontic and surgical treatments can not be applied, it is inevitable to carry out the restorative treatments to accomplish the function and the aesthetics.

This clinical report presents the rehabilitation of a bilateral open bite with midline maxillary and mandibular diastemas using zirconia ceramic restorations.

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### Introduction

The face is the most visible part of the body. The most important components of the face are mouth and teeth. Especially the presence of an anterior open occlusal relationship negatively affects dentofacial harmony.<sup>(1,2)</sup> Anterior open occlusal relationship and diastemas between teeth prevent the exact functions of chewing and speech. Open bite is the status of absence of closure of the teeth.<sup>1,3,4</sup> Open bite can be dental or skeletal.<sup>1,2,3</sup>

There are many factors related to the anterior open occlusal relationship such as variations in alveolar growth or dental eruption, disproportionate neuromuscular growth and aberrant neuromuscular function related to malfunctions of the tongue or oral habits.<sup>5,6</sup>

Diastema is the status of the absence of proximal contacts between adjacent teeth.<sup>1,7</sup> The etiology of diastema is generally related to dental anomalies of size and shape, dentoalveolar discrepancies and Bolton discrepancies.<sup>5,8,9</sup>

In some cases, orthodontic treatment will correct the anterior open occlusal relationship and provide the closure of the diastema. But in some situations, orthodontic treatment alone is not enough. Orthodontic treatment alone cannot make the proximal contacts with appropriate vertical and horizontal overlaps. So that, a restorative treatment is required to optimize results.<sup>5,8,10,11</sup> In this situation, the orthodontic treatment supplies the spaces between teeth prior to the restorative procedures.<sup>(5)</sup> For this purpose the composites, porcelain laminate veneers, metal-ceramic restorations, all-ceramic crowns and zirconia restorations can be used.<sup>12,13</sup>

Newly core material for all-ceramic FPDs is yttrium-oxide partially-stabilized (Y-TZP) zirconia.<sup>14,15</sup> Y-TZP shows superior strength, better mechanical performance, high fracture resistance, more abrasion resistance, color stability and aesthetics than other all-ceramic cores. Additionally, Oxide ceramic exhibits high biocompatibility with low bacterial surface adhesion, reduced thermal conductivity.<sup>14,16</sup>

### Case Report

A 15-year-old girl with an anterior open occlusal relationship associated with diastema admitted to Dicle University Faculty of Dentistry Department of Prosthodontics (Fig.1).

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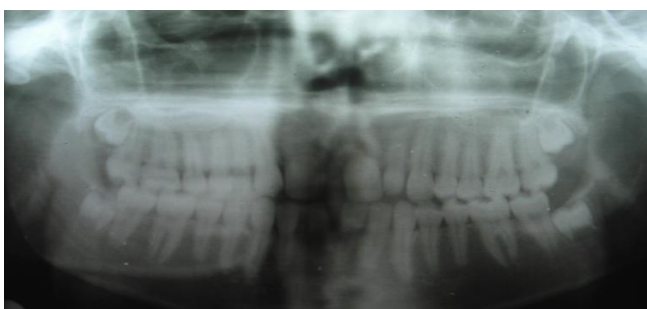
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**Figure 1.** Clinical view before treatment.

Radiographic and clinical examinations were made. Patient's right maxillary lateral and canine incisors were replaced inborn. (Fig.2) First of all caries were treated in pedodontics clinic. After conservative intervention, the patient was presented to the department of orthodontics. Dentoalveolar and Bolton discrepancies were identified. Treatment planning included orthodontic treatment and restorative restorations.



**Figure 2.** Radiographic view.

Fixed conventional 0.022 x 0.025- inch slot edgewise appliances were placed to level and align the maxillary and mandibular arch. The archwire sequence progressed from a 0.016-inch nitinol wire to a 0.019 x 0.025- inch rectangular stainless steel wire. Elastics (GAC Intl, Inc) were used for dental retraction. Diastemas between maxillar and mandibular central incisors were treated.(Fig.3) Maxillary right canine was decided to abraded to look like a lateral incisor. Maxillary right lateral and maxillary left lateral incisors were decided to prepare to use zirconia framework ceramic crowns.



**Figure 3.** After orthodontic treatment.

After the orthodontic treatment, we took impression from maxilla and mandible by alginate impression material (Tulip Alginate impression material, Cavex, Haarlem-Holland) and diagnostic models were obtained by using type 4 plaster (Gypstone 3000 + Die Stone, IMICRYL, Konya-Turkey). Face arc (Denar Slidematic Facebow, Whip Mix Corp., USA) and centric relation records were obtained from the patient. The patient's rest vertical dimension and the occlusal vertical dimension were compared. There was no decrease in occlusal vertical dimension (Free-way space of 3 mm).

Models were moved to semi-adjustable articulator (Denar Advantage, Whip Mix Corp., USA). Wax-up models were prepared in the laboratory for the prescribed treatment. Maxillary right canine was abraded to look like maxillary right lateral incisor. Teeth preparations were made in the design of proper margin type according to the zirconia ceramic restorations. Maxillary right lateral was prepared as it's like a canine. Temporary restorations were made properly to the wax-up model.

After evaluating aesthetics and functions during try-in of the zirconia frameworks (Fig.4), we cemented zirconia ceramic restorations by

zinc polycarboxylate cement (Durelon, 3M Espe, Seefeld-Germany). (Fig.5) Class 1 upper and lower jaw relationship was provided and patient satisfaction was achieved functionally and aesthetically. A Hawley retainer was placed immediately after restorations were completed to ensure buccolingual contention. The patient was recalled for 3-6 month intervals.



**Figure 4.** Try-in of zirconia frameworks.



**Figure 5.** After cementation of zirconia ceramic crowns.

## Discussion

Etiology criterias in the presence of open bite cases with diastema should be evaluated carefully.<sup>1,17</sup> Primary treatment for adult patients with severe skeletal open bite is the combined treatment of both orthodontics and maxillofacial surgery.<sup>1,18</sup> But especially after the orthodontic treatment, restorative treatment is applied to the patient to bring satisfactory aesthetics and function. One of the issues to be aware of these applications is compliance with the restoration of the lip line.

A natural and harmonic smile may only be obtained after consideration of individual features. Bolton and cast discrepancy analyses are the previously described methods to identify the actual size of the maxillary anterior or mandibular teeth. The distribution of spaces between the anterior teeth can be decided well

by the restorative dentist to determine the most favorable aesthetic results.<sup>5,8,10,11</sup>

A variety of prosthetic approaches can be applied in cases of diastema. For example, laminate veneer restorations, metal-supported restorations, all-ceramic restorations and zirconia ceramic restorations. In our case, because of aesthetic excellence and high stress resistance, zirconia framework ceramic restorations were used.

## Conclusions

As a result, in our case report, the patient's aesthetic, phonation, and function were restored by the appropriate prosthetic rehabilitation technique after the proper orthodontic treatment for open bite cases with diastema.

## Declaration of Interest

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