Non-extraction treatment of a Class II case with a missing mandibular central incisor using a CAD/CAM lingual orthodontic system

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dult orthodontic patients insist on aesthetic treatment options that have the least possible impact on their work and life. Clear aligners are an excellent treatment option that is well suited to many comprehensive orthodontic treatment plans. You may have already figured out that case selection is essential, and some movements are more difficult to perform well with removable aligners.

Incognito lingual braces (3M ESPE) are an ideal treatment option for adult patients who are best treated with a fixed system and who are looking for invisible orthodontics. They are also perfect for patients who are not committed to dealing with removable aligners. Lingual braces are an exciting advancement in orthodontic care, and many patients are thrilled. I would like to present a brief background on the Incognito lingual braces system, followed by a discussion of a case I treated with lingual braces and why I chose this system.

The Incognito appliance is manufactured using state-of-the-art CAD/CAM technology. The first step in the fabrication process is taking accurate polyvinyl siloxane impressions and bite registration using polyvinyl siloxane, and then creating a model in plaster and a diagnostic wax-up thereafter (according to my direct instructions). The final model is then sent to me digitally for feedback, and I can make a series of changes until I am satisfied with the final result. The final model is then scanned with a 3D scanner and the brackets are designed on the computer.

The bracket and archwire system consists entirely of individualised components. The bracket bases and bodies, the position of the bracket body on the bases, the bracket-slot orientation (ribbonwise), the direction of the archwire insertion (vertical or horizontal) and the archwire geometry are all individually adjusted to each tooth, according to malocclusion and the orthodontist's instructions. Rapid prototyping technology is used for the manufacturing of the lingual brackets.

The brackets are then cast from gold alloy, mounted in a flexible indirect bonding tray, and shipped out ready to be bonded. Direct bonding is feasible too, owing to the extended individual bases.

Bending archwires is one of the most difficult tasks in orthodontics. In this system, computer-operated bending of archwires using robots is used to manufacture precisely shaped archwires. Even superelastic archwires can be precisely shaped. This helps solve three major problems in lingual orthodontics: 1. Patient discomfort during the adaptation phase: The appliance is designed to be as flat as possible, not much higher than a bonded retainer; this significantly improves patient comfort. 2. Difficulties in re-bonding: The customised bracket base covers the major part of the lingual tooth surface and therefore allows direct re-bonding without the need for any other positioning aids. 3. Inaccuracies in finishing: Inaccuracies of the slots due to production and resulting variation in torque play are now part of the past, owing to the Incognito. Measuring rates show divergences of not more than 0.08mm between the slots. The precisely shaped archwires also make high-standard finishing easily achievable.

This case report describes the treatment of a patient with a skeletal Class II malocclusion due to a retrognathic mandible and protrusive maxilla. He also had a congenitally missing mandibular left central incisor. The extraction of a single mandibular incisor can be employed as a compromise treatment of certain malocclusions if the end result fulfills the requirements for a healthier dentition that is functionally and aesthetically harmonised in relation to the surrounding structures. In this case, one of these incisors was missing so extraction was not necessary.

The Class II malocclusion was corrected by non-extraction orthodontic treatment with a CAD/CAM fixed lingual appliance (Incognito). The Class III molar relationship had not changed at the end of treatment, but a Class I canine relationship was achieved and the facial profile improved owing to improvement in the position of the mandibular incisor in relation to the mandibular plane, which affects the position of the lower lip.

Diagnosis and aetiology
The patient was male, aged 25 years and nine months, and had the chief complaint of crowding and lower dental arch had about 7mm of crowding and lower dental arch had 8mm of crowding, excluding the width of the missing mandibular incisor, and the maxillary lateral incisors were in crossbite (Fig 2).

According to cephalometric analysis, there was a Class II jaw relationship and normal vertical facial height. The patient was in good health and his medical history showed no contra-indications to orthodontic therapy (Fig 5).

Treatment objectives
The treatment objectives included correction of the maxillary and mandibular anterior teeth. He had Class III canine and molar relationships on both sides, a 2mm overjet, a 4mm overbite, a missing mandibular left central incisor, the maxillary midline was coincident with the mid-sagittal plane, the mandibular midline was shifted to the left, the maxillary dental arch had about 7mm of crowding and lower dental arch had 8mm of crowding, excluding the width of the missing mandibular incisor, and the maxillary lateral incisors were in crossbite (Fig 2).

Treatment alternatives
Three treatment options were suggested to the patient. The first alternative entailed labial orthodontics using either metal or clear brackets. The second option entailed lingual orthodontics, as the aesthetic demand was very high for the patient and clear aligners would not have been able to achieve the needed results. Both Options one and two were non-extraction.

The third option was to extract all four first premolars but this would have affected the facial profile negatively. After detailed discussion with the patient, we chose Option two, non-extraction using a lingual appliance.

Treatment progress
Treatment began with customised, pre-adjusted, CAD/CAM fixed lingual appliances (0.558mm slots) placed on both the maxillary and mani-
Performing lingual orthodontic treatment for each patient in the average orthodontic office is now a reality. The treatment results are of a high level, and all our patients may benefit from an invisible appliance. Former problems, such as discomfort, speech alteration, finishing inaccuracies, and particular tooth anatomy, can be overcome in this manner.

The extraction of the mandibular incisors constitutes a therapeutic alternative in treating certain anomalies. It is not a standard approach to symmetrically treating most malocclusions, but the therapeutic aims must be adjusted in certain clinical situations to individual patient needs, even when this means that the final occlusion achieved is not ideal. The deliberate extraction of a mandibular incisor in certain cases allows the orthodontist to improve occlusion and dental aesthetics with minimal orthodontic treatment. In all cases, however, a diagnostic cast is required to determine the occlusal possibilities precisely.

Discussion
The key to success in lingual orthodontics in terms of both professional and patient satisfaction is practice and training. The Incognito system can be used for all types of malocclusions with the same precision as labial braces. The possibility of incisor extraction should be a part of every clinician’s portfolio of treatment techniques. If it is planned carefully and executed properly, incisor extraction can be an effective way of satisfying a particular set of treatment objectives.
Author Info

Dr. Khaled Abouseada is a consulting orthodontist involved in private practice in Saudi Arabia, Bahrain and Egypt. He lectures orthodontics at the Batterjee Medical College and Specialized Academy for Medical Training. He has lectured at many international dental and orthodontic forums. He is a certified trainer for CAD/CAM orthodontics and serves on the editorial board of Dental Tribune Middle East. He won the I Love My Dentist Award in 2010–2012 and the MENA Award for Orthodontic Best Case in 2010–2012.

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Editorial note: A complete list of references is available from the publisher.

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Fig. 5a–g Showing upper and lower initial and final comparing them to their corresponding set-up