

## TREATMENT PROGRESS (Continued)

The number of upper Aligners was 24 and 25 for the lower. Attachments were placed on teeth where it was thought they would help align the long axes and promote extrusive movements. A secondary function of attachments is the retention of Aligners. Treatment progressed uneventfully, but a mild lateral open bite around the left canine region persisted (Figure 3). We consulted with the patient again to discuss case refinement with additional Aligners versus fixed appliances. She elected to wear fixed appliances on her lower teeth.

After about one year of maxillary and mandibular Invisalign treatment, fixed appliances were placed in the mandibular arch only. Clear buttons were bonded on the upper left canine and premolar teeth (Figure 4). From these, the patient wore vertical elastics attached to Kobayashi hooks in the lower arch. Cuspid rise on the left side was achieved in three months. The total treatment time for the case was 15 months.



**Figure 4.** Mandibular fixed appliances are in place with bonded buttons to aid in the closure of lateral open bite. Note the acceptable esthetics upon smiling.



### CLINICAL TIP

Clear brackets are preferred over ceramic ones, as they are more esthetic. Also, the use of latex-free clear elastics (may be purchased from AlignTechnology) compliment the esthetics. Fast extrusions generally require more rigorous retention, preferably with a bonded lingual retainer.

## POST-TREATMENT ASSESSMENT

The transformation this patient experienced is readily apparent from the extraoral and intraoral images (Figure 5). The occlusion is perfectly balanced except for the end-on relationship on the left side molars, in part due to tooth-size discrepancy. The patient did not wish to receive additional treatment to correct the crossbite tendency. In retrospect, our intense focus on the correction of the canine relationship made us overlook the crossbite. It would have been better to have banded the first mandibular molar on that side and run crossbite elastics while the canines were undergoing treatment. Because an end-on relationship of the two molars when all other teeth function properly is not known to cause any harm, we went along with the desires of the patient. We chose to use a fixed retainer in the lower incisor region as we wished to be cautious and prevent any potential relapse of the lower mandibular left canine and incisors. This is also recommended whenever extrusive tooth movements are executed. This patient is another success story, which makes opening the office every morning for business a joy. (Continued on back)



**Figure 5.** Clinical images of the final result and the corresponding ClinCheck sequences.

Note the left side now has canine guidance.



### EDITOR'S NOTE

Whenever extrusion is planned, it is helpful to first create space 1-2 millimeters wider in the ClinCheck images than the mesiodistal diameter of the tooth to be extruded. Also critical is to understand that since the Aligners (newly inserted ones, in particular) tend to flare out at the gingival margins, the grip on the attachment may not be very secure. It could be helpful, especially in the maxillary arch, to place the attachments more occlusally wherever extrusion is desired. These details can be specified at the time the ClinCheck images are reviewed.

To view the ClinCheck animated images depicting the progress of this case, visit [www.myinvisalign.com/studies](http://www.myinvisalign.com/studies) and click on "Dr. Norris' Case (2002)."

# Cases & Commentaries in Orthodontic Technology

## From the Editor

There has never been a lazy genius. Lucky for humankind, the history of science is filled with geniuses who changed the flow of knowledge. These hard working individuals were also superbly perceptive. Today, atomic energy is utilized more than any other source because the Curies worked hard and long in their laboratory to discover Polonium and radioactivity. Unlike in World War I, soldiers of today do not die of pneumonia or other diseases because Fleming, practically living in his laboratory, perceived the significance of a lack of bacterial growth in his Petri dish cultures to discover penicillin. Similarly, Einstein mulled over his observations of light to discover the photocell or of a passing train to propose  $E=mc^2$ , while the first equation he learned was probably  $2x2=4$ .

Of course, each one of these paradigm shifts had a matching group of skeptics. They pontificated over the demerits of discoveries. It was comfortable when the earth was flat, so why make it round? They thought  $2x2=4$  was enough. It was correct and it got the job done, so why change? Also true, if Einstein had never learned  $2x2=4$  he would not have been able to propose a novel set of equations that govern the universe.

All sciences — physical, biological or clinical — have humble beginnings. Early in the evolutionary process mistakes are often made. Those badly mutated organisms do not survive when confronted by the environment. But those that do survive replace the existing life forms to propagate the better and more robust species.

Invisalign is a link in the evolutionary chain of orthodontic appliances. Today, it has gone beyond the  $2x2=4$  stage, and continues to mature. Improvements in the software, image capture, the appliance itself or its applications precede clinical results. Orthodontic treatment takes a while. *Cases & Commentaries in Orthodontic Technology* was launched to broadcast this evolutionary process to the orthodontic community. Clearly, when fixed appliances fall short of treatment goals, Invisalign can do better. Alternatively, there are times when Invisalign works better when preceded by a fixed appliance phase. Ultimately, the clinician is obligated to treat with consideration to patients' perceived quality of life.

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# Invisalign Treatment Modified to Accommodate Patient's Input

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## INTRODUCTION

Crowding is the most common challenge presented to the orthodontist. In the traditional sense, a space deficiency greater than 4 millimeters might make the clinician consider extractions. With the advent of interproximal reduction, however, it became possible to treat the borderline crowding without extractions. In fixed appliance treatments, a less noticeable occurrence is the occlusal-gingival irregularities of teeth in crowded situations. This particular characteristic requires significant attention when Invisalign is the appliance of choice: extrusive movements need to be deliberate.



### CLINICAL TIP

Extrusive movements, especially of the anterior of teeth, require very carefully planned mechanical strategy. Auxiliary force modules are nearly always necessary.

## CASE REPORT

The chief complaint of this patient was crowding. Her straight profile is readily apparent in the pictures (Figure 1). Our diagnostic measurements revealed a Class I dentition with 4 mm of crowding in the maxilla and 6 mm in the mandible. The left side first molars were in crossbite. Canines of the left side were out of occlusion, blocked-out buccally and in infraocclusion. Anterior mandibular excess tooth-size discrepancy, in part, contributed to the problem. An extraction treatment plan was not an acceptable option to the patient. Cephalometrically, she was labeled as a slight Class II. The upper incisors were in normal position, but the lowers were mildly procumbent. Her mandibular plane angle was higher than normal. Numeric readings from the cephalometric radiograph were: SNA=81; SNB=77; ANB=4; IMPA=99 and U1-NA=23.

## TREATMENT PLAN

To accommodate the non-extraction input we had received from the patient, we felt it critical to perform the necessary IPR most strategically. Attention to detail in treatment planning with IPR is of paramount importance. Some treatments fail no matter what appliance is used, simply because tooth sizes are reduced in a nonchalant manner. We prefer to do a wax set-up (Figure 2). This technique better identifies any tooth size discrepancies early on. In this case, the set-up specifically identified the areas where IPR should be performed. Moreover, IPR was performed prior to making PVS impressions. Such strategy facilitates not only a more precise correction of the existing tooth size discrepancy, but also makes highly accurate ClinCheck movements possible. As mentioned above, because in the resolution of crowding extrusive movements are oftentimes necessary, the patient was informed fixed appliances might be used to complete the extrusion quickly. *(Continued inside)*



**Figure 1.** The pre-treatment clinical images of the patient and the corresponding ClinCheck images.

Note the left side occlusal problems in the clinical images.



**Figure 2.** The wax set-up of this patient's treatment objectives.



### CLINICAL TIP

The diagnostic wax set-up is the key to determining the exact location and amount of IPR. In the preparation of ClinCheck images, technicians employ a predetermined set of criteria to identify the contacts that require IPR. In contrast, a wax set-up allows the clinician to effortlessly bypass standard operating procedures to explore and experiment with different scenarios.

## TREATMENT PROGRESS



**Figure 3.** Following the initial Aligner series, a left side lateral open bite was evident.

*(Continued on next page)*