

PATIENT'S CHIEF CONCERN

The 17 year old patient disliked the way his teeth looked and had difficulty eating certain foods. He was a senior in high school and wanted his teeth to look better before he went to college. He previously had orthodontics, and wearing braces again was not an option.



INITIAL



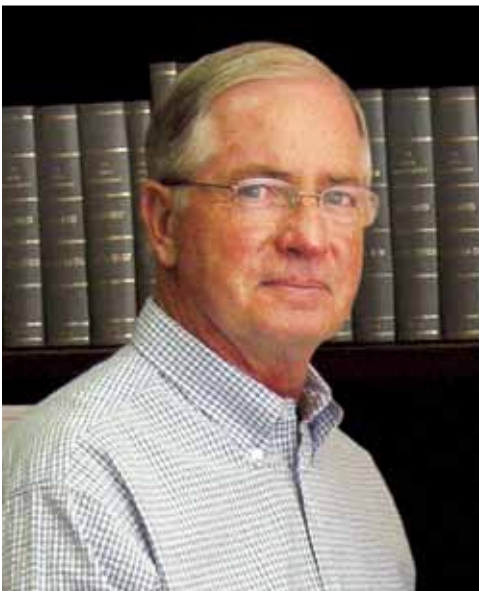
5 YEARS POST TREATMENT

CLINICAL FINDINGS

- Class I canines and molars
- 3+ mm asymmetrical anterior open bite
- Mild anterior crowding
- Tongue thrust and forward tongue posturing
- Excessive overjet produced by large maxillary central incisors
- 2 mm midline discrepancy

TREATMENT PLAN

- Close the open bite via a combination of absolute extrusion and relative extrusion
- Instruct the patient to squeeze on the aligners to produce posterior intrusion to help close the open bite
- Use IPR on the maxillary incisors to reduce the proclination and correct the crowding
- Use IPR on the mandibular incisors to correct the midline and the crowding
- Use swallowing exercises to correct the tongue thrust and the forward tongue posturing
- Treat this case as an anterior case, so that movement of the posterior teeth will not cause further bite opening. Invisalign is an excellent orthodontic system that allows you to make the decision that some teeth will move and others will not. With fixed appliances all the teeth can be moving and some of the good tooth relationships can change due to poor bracket position and reciprocal forces.



“This case was treated in 2004 before Best Practices Protocol and the recent G3 innovations and has been documented for five years post treatment stability. After going through all the Invisalign growing pains and all the critics, this case has made me a believer. Invisalign is now a large part of my practice and my first choice for the correction of open bite cases, because there is no appliance that controls the vertical and autorotation of the mandible better than aligner wear. I have been sharing my knowledge with the University of Oklahoma Orthodontic Residents for the last four years. Definitely one of the highlights of my orthodontic career.”

DR. KENT HALL DDS MS

# Closing Open Bites with Invisalign®

## Dr. Kent Hall DDS MS

### ACTIVE TREATMENT TIME

24 Months

### ALIGNERS USED

25 U / 27 L Aligners

### ATTACHMENTS

0.5 mm Horizontal Ellipsoid Attachments

- Today I would use optimized extrusion attachments with the standard velocity of 0.25 mm per stage

### REFINEMENT

6 U/L Refinement Aligners

- Horizontal beveled attachments were used for the final open bite correction. Today I would use optimized attachments

### RETENTION

- Upper and lower clear retainers worn nightly

### IPR

- 0.5 mm IPR on the upper and lower incisors to help reduce the proclination of the maxillary incisors, correct the crowding, and correct the mandibular midline



ClinCheck Superimpositions  
(Shaded= initial stage; White= final stage)

## Closing the Open Bite

In this case, the open bite was closed via a combination of relative extrusion and absolute extrusion, and likely with some help from posterior intrusion.

Relative extrusion was produced by reducing the proclination of the maxillary incisors. At the time of treatment in 2004, absolute extrusion was considered a very difficult movement. So I chose to align the anteriors, correct the midline and reduce the proclination, before beginning the absolute extrusion phase of treatment (aligner 15 to aligner 27). 0.5 mm horizontal ellipsoid attachments were then placed on the upper and lower incisors and cuspids. The patient was given one aligner at a time. The aligners were worn for three week intervals to produce absolute extrusion in 0.125 mm increments. The patient was also instructed to squeeze on the aligners to produce posterior intrusion to help close the open bite. The patient then wore 6 case refinement aligners with horizontal beveled attachments to complete the case.

If I treated this case today, I would not have the patient wear the aligners in three week intervals during the absolute extrusion phase unless the teeth were not tracking. That change would have reduced the treatment time by four months. Also I would use the new optimized attachments with standard velocity for extrusion and have the patient use a chewie as a force module only in the posterior every time the aligners were inserted. I would still have the patient squeeze on the aligners if it did not cause any TMJ

symptoms. Because of the excellent results achieved on this case, I could also say that I might not have done anything different.

## Outcome and Retention

The patient stayed highly motivated throughout the entire treatment. Almost five years post treatment, he is still religious about night time clear retainer wear that he knows is for the rest of his life. Clear retainers are my choice for retention in open bite cases, because you still need to control the vertical. This case demonstrates that with a proper diagnosis and a cooperative patient, one can get excellent results with Invisalign.

Invisalign is now my first choice for the correction of open bite cases, because no appliance controls the vertical and autorotation of the mandible better than aligner wear. The ability to control the vertical and autorotation of the mandible also makes Invisalign an excellent choice for Class II correction. The bite plane eliminates the occlusal interferences, and Precision Cuts have eliminated the lab time that used to be necessary before each appointment. Because of the bite plane affect, Invisalign is also my choice for patients with severe TMJ symptoms. The aligners act as a 22 hour occlusal splint, and you can adjust the occlusion on the aligners if necessary.

*My Invisalign patients make my day. I know that the more Invisalign patients I see every day, the fewer patients I will see with bent archwires, broken brackets, poor hygiene, lip irritations or sports injuries.*



For additional details and to earn 1 CE hour for this case study, visit:  
[www.aligntechinstitute.com/hall](http://www.aligntechinstitute.com/hall)

## TIPS FOR REVIEWING CLINCHECK® TREATMENT PLANS

My number one tip for success with Invisalign is to spend quality time analyzing and modifying the patient's ClinCheck® treatment plan. My system for ClinCheck analysis is as follows:

**1. VELOCITY AND STAGING** Ideally, all the teeth should move simultaneously to their final positions. The overall velocity will be determined by the teeth requiring the most difficult movements. I like the arches to finish at the same time. If that is not feasible, passive aligners can now be ordered for the arch that finishes first.

**2. IPR** There should be no IPR without adequate access to the contact areas. Just like with archwires, alignment is obtained mainly by expansion and proclination. IPR may then be necessary to correct residual crowding, correct the midline or correct a tooth size discrepancy.

**3. ATTACHMENTS** Always check for the use of the Power Ridge™ feature, because attachments and Power Ridge feature can not be used on the same tooth. Teeth requiring rotation correction, angulation changes or extrusion need attachments. The horizontal beveled attachments are still an excellent attachments, but the new optimized attachments are producing excellent results with less bulk. My best advice is never use less attachments than you think are necessary in fear that the patient will not be able to remove the aligners. I have not had a patient who could not figure out a way to remove their aligners.

**4. TOOTH POSITIONS** Finally, note the teeth that did not have ideal final positions, and detail the additional tooth movements required.

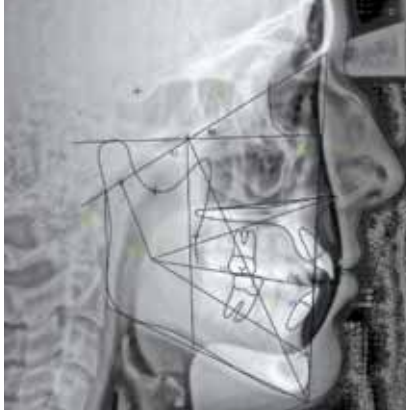


# Closing Open Bites with Invisalign®

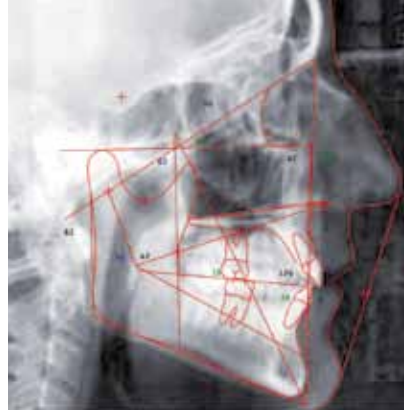
## Dr. Kent Hall DDS MS

CASE STUDY

### Cephalometric Tracings



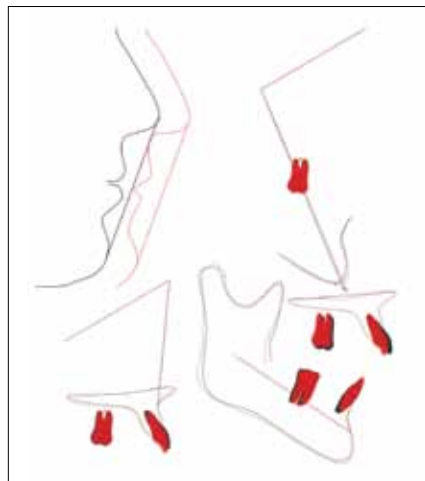
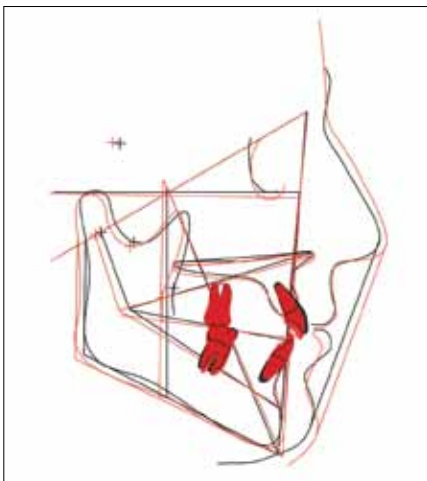
Initial



5 Years Post-Treatment

### Superimpositions

(Black= pre-treatment; Red= post-treatment)



### KENT HALL DDS MS

Dr. Hall has practiced orthodontics in his home town of Duncan, Oklahoma since 1979. After two years at the University of Oklahoma, he was accepted to Northwestern University Dental School and graduated in 1971. After completing a rotating dental internship at St. Anthony Hospital in Oklahoma City, he practiced general dentistry with his father for five years. After deciding to specialize, he was accepted to St. Louis University Orthodontic School and received his masters in orthodontics in 1979. Dr. Hall has been treating patients with Invisalign since 2000 and has started over 500 cases. One of his teen cases was selected for the showcase at the 2010 Invisalign Summit and one of only sixteen cases chosen for the Invisalign Teen Case Gallery publication.

Dr. Hall is currently an Assistant Clinical Professor at the University of Oklahoma Dental School Department of Orthodontics. He is teaching the graduate students / residents how to treat patients with Invisalign. He is also an active member of the American Association of Orthodontics, the Southwest Society of Orthodontics, the American Dental Association, The Oklahoma Dental Association and the Stephens County Dental Society.

### Panoramic X-Rays



Initial



5 Years Post-Treatment

### CEPHALOMETRIC MEASUREMENTS (STEINER ANALYSIS)

Measurement	Units	Norm.	Clin. Dev.	Initial	Final
SNA	(deg)	82.0	-2.4	74.9	76.4
SNB	(deg)	80.0	-2.1	73.6	74.9
ANB	(deg)	2.0	-0.4	1.2	1.5
Mx 1 - NA	(mm)	4.0	1.7	9.1	7.0
Mx 1 - NA Angle	(deg)	22.0	2.4	36.3	28.0
Md 1 - NB	(mm)	4.0	0.6	5.8	5.5
Md 1 - NB Angle	(deg)	25.0	0.9	30.4	24.7
PO - NB	(mm)	1.0	1.8	4.2	5.4
Occlusal Plane - SN	(deg)	14.0	1.9	20.6	16.5
GO-GN - SN	(deg)	32.0	1.1	36.8	33.9
Interincisor Angle	(deg)	130.0	-3.0	112.1	125.8
Wits Appraisal	(mm)	1.1	-1.6	-2.0	0.7
calculated ANB	(deg)	2.0	0.1	2.1	2.2
FMA	(deg)	25.0	0.4	27.2	24.0
FMIA	(deg)	65.0	-2.0	52.9	60.1
IMPA	(deg)	90.0	1.7	99.9	95.8