TECHNIQUES THAT IMPACT ADULT TREATMENT
ALIGNERS
Clark D. Colville, DDS, MS

Dr. Vincent G. Kokich
1944 - 2013

CLEAR ALIGNERS
Invisalign®
Align Technology, Inc
San Jose, California
ORTHODONTICS & ADULT TREATMENT

- ADA Survey - orthodontic treatment
  - 2003-2010 20% decrease in orthodontic patients
  - 2010 80% < 21 years of age

- AAO Economics of Orthodontists Survey – 2012
  - New patient exams increase 7% from 2010
  - # of patients in active treatment increased 20%
  - Adult treatment increased 14% from 2010
  - 44% male / 29% increase from 2010

US DEMOGRAPHICS 2010

US DEMOGRAPHICS 2020
1998 – INVISALIGN LAUNCHES

- Clayton M. Christensen, Harvard Business Professor
- Sustaining technology: improving wires and brackets
- Disruptive technology: clear aligners
- Cheaper to produce
- Initially marginalized
- Simpler
- Smaller
- Better performing
- Easier to use
- Unexpectedly displaces existing products

INVISALIGN - GROWTH

- 2013 Q4: Revenue $166.2 million, + 25.1% y/y
- 2013: N.A. Ortho 159,575 cases shipped +15.9% y/y

  - Growth largely driven by Orthodontist customers, reflecting increasing confidence in Invisalign, due to continued product evolutions such as Invisalign Q4 and SmartTrack.


MARKET IMPACT

Invisalign Adult vs. Teen Case Shipments
INCREASE IN ADULT TREATMENT

- Demographics
- Generational Impact
- Esthetics
- Comfort

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DIAGNOSIS & TREATMENT PLANNING

Clinical Exam
Health History
Diagnostic Records

Prioritized Problem List
Solutions to Individual Problems

Optimal Treatment Plan
Mechano-Therapy / Force Systems

Pt. Choice
Dr. Decision

Esthetics
Comfort
Cost

Effectiveness
Efficiency
Cost
The Application Of Continuous Forces To Orthodontics

C. J. Burstone, D.D.S., M.S., J. J. Baldwin, D.D.S., M.S.D.,
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Indianapolis, Ind.

Introduction
Increasing evidence suggests the desirability of employing orthodontic appliances which are capable of delivering light continuous force. An ideal approach would involve general and engineering principles rather than the application of the forces. 1) the distance over which the force acts and 2) the uniformity of the force within this distance.

Even though theoretically it would be possible to produce any type of tooth movement with a single force or two vertical and horizontal forces in addition.

The Application Of Continuous Forces To Orthodontics - The Angle Orthodontist, C.J. Burstone - 1961

SUSTAINING TECHNOLOGY

• Continual development of light continuous forces
• Doctor ability to control the forces

General Characteristics of Orthodontic Forces
• Optimal light, continuous
• Ideal material
• Maintains elasticity over a range of tooth movement

THE EVOLUTION OF LIGHT FORCES

Stainless Steel
TMA Chromium Cobalt
Braided Nickel Titanium
Plastic

SMART TRACK
A PROPRIETARY MATERIAL

• Light & Continuous Force

SMART TRACK PROPERTIES

• Lower plastic deformation
SMART TRACK PROPERTIES

- Better adaptation, more precise fit

Abstract:

Wire (force system) selection for use in an orthodontic appliance is usually based upon clinical impressions. This is unsatisfactory. A far better basis for selection would be measured values of the forces exerted by the arch wire (force system), both initially on insertion of the appliance and their variation with time as a result of the tooth movement and stress relaxation of the wire (force system).

Force relaxation in orthodontic arch wires.

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Wire (force system) selection for use in an orthodontic appliance is usually based upon clinical impressions. This is unsatisfactory. A far better basis for selection would be measured values of the forces exerted by the arch wire (force system), both initially on insertion of the appliance and their variation with time as a result of the tooth movement and stress relaxation of the wire (force system).

Force relaxation in orthodontic arch wires.
INVISALIGN – A FORCE SYSTEM

- 1998 - 2007
  - Development of state of the art manufacturing
  - Best Practices
  - ClinCheck / Virtual Treatment Planning

- 2008 Power Ridges, BP automatic update & Teen
- 2009 Root velocity staging, optimized attachments
- 2010 G3, ClinCheck 3.1
- 2011 G4, iOC (iTero) Digital Scans
- 2013 Smart Track, G4 Bicuspid Root Control Attachments
- 2014 G5 – Deep Bite: features to level lower Curve of Spee
- 2014 ClinCheck Pro – doctor controls tooth movement

RESEARCH AND DEVELOPMENT

Shape engineering technology
Force Measurement Tool

FORCE TESTING
SIGNIFICANT IMPROVEMENTS

• 2009
  • Root velocity staging
  • Optimized attachments

• 2010 (G3)
  • Precision cuts
  • Smart forces
  • Optimized attachments

• 2011 (G4)
  • Multi–plane attachments
  • Open Bite attachments
  • Root control attachments

2012: G4 - LATERAL INCISORS

Optimized Multi–plane movement features

2013: G4 - ENHANCEMENTS

• Root control
  • All bicuspid
  • Upper lateral incisors
2012 – EN MASSE EXTRUSION

- All 4 incisors
- Variable forces
- Secondary forces

INVISALIGN SMARTFORCE SYSTEMS

- Torque
  - Upper and lower arch - lingual root torque all incisors
- Rotations
  - Upper arch - lateral incisors, cuspids, bicuspids
  - Lower arch - cuspids, bicuspids
- Extrusion
  - Upper arch - centrals, laterals, cuspids
  - Lower arch - centrals, laterals, cuspids, bicuspids*
- Root Movements
  - Upper arch - centrals, laterals, cuspids, bicuspids
  - Lower arch - cuspids, bicuspids, lower incisor torque
- En Masse Movements
  - Upper arch - extrusion of 4 incisors
  - Lower arch - arch leveling, extrusion of bicuspids, intrusion of incisors*

THE LAST ELEMENT

DOCTOR CONTROL
OCCLUSION (LACK OF)

INITIAL ALIGNERS COMPLETED

TREATMENT COMPLETED
INVISALIGN FORCES

LIGHT
CONTINUOUS
MEASURED
EFFICIENT
CONTROLLED

PATIENT BENEFITS

ESTHETICS
COMFORT
HYGIENE
LIFESTYLE
RESULTS

THANK YOU!

Most of us can read the writing on the wall; we just assume it’s addressed to someone else.

Ivern Ball

Special thanks to Dr. Lee W. Graber