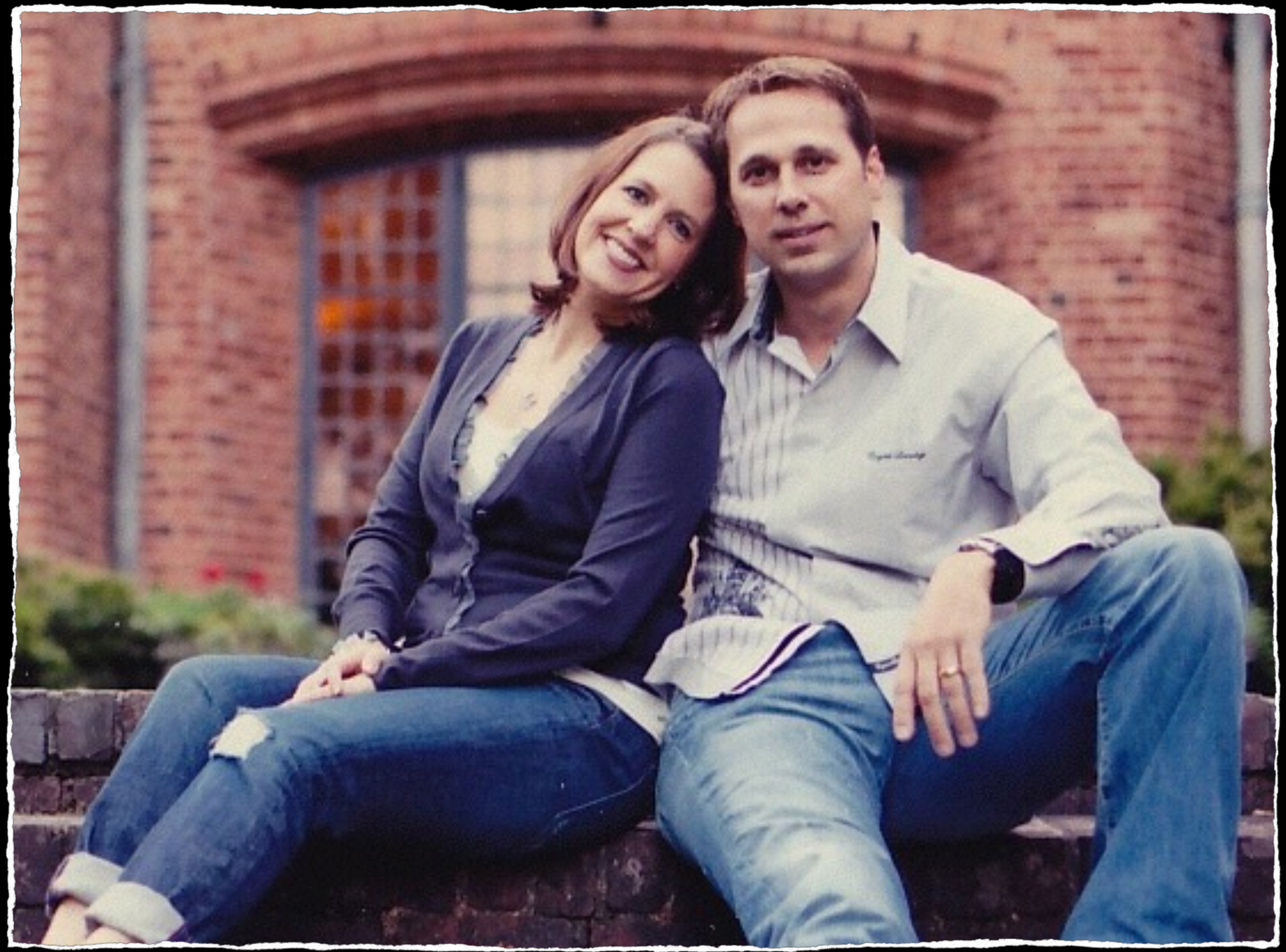
Accelerated Orthodontics

Dr. Bill Dischinger
Dischinger Team Orthodontics
Lake Oswego, OR




Ollar




Ollar


Ollar

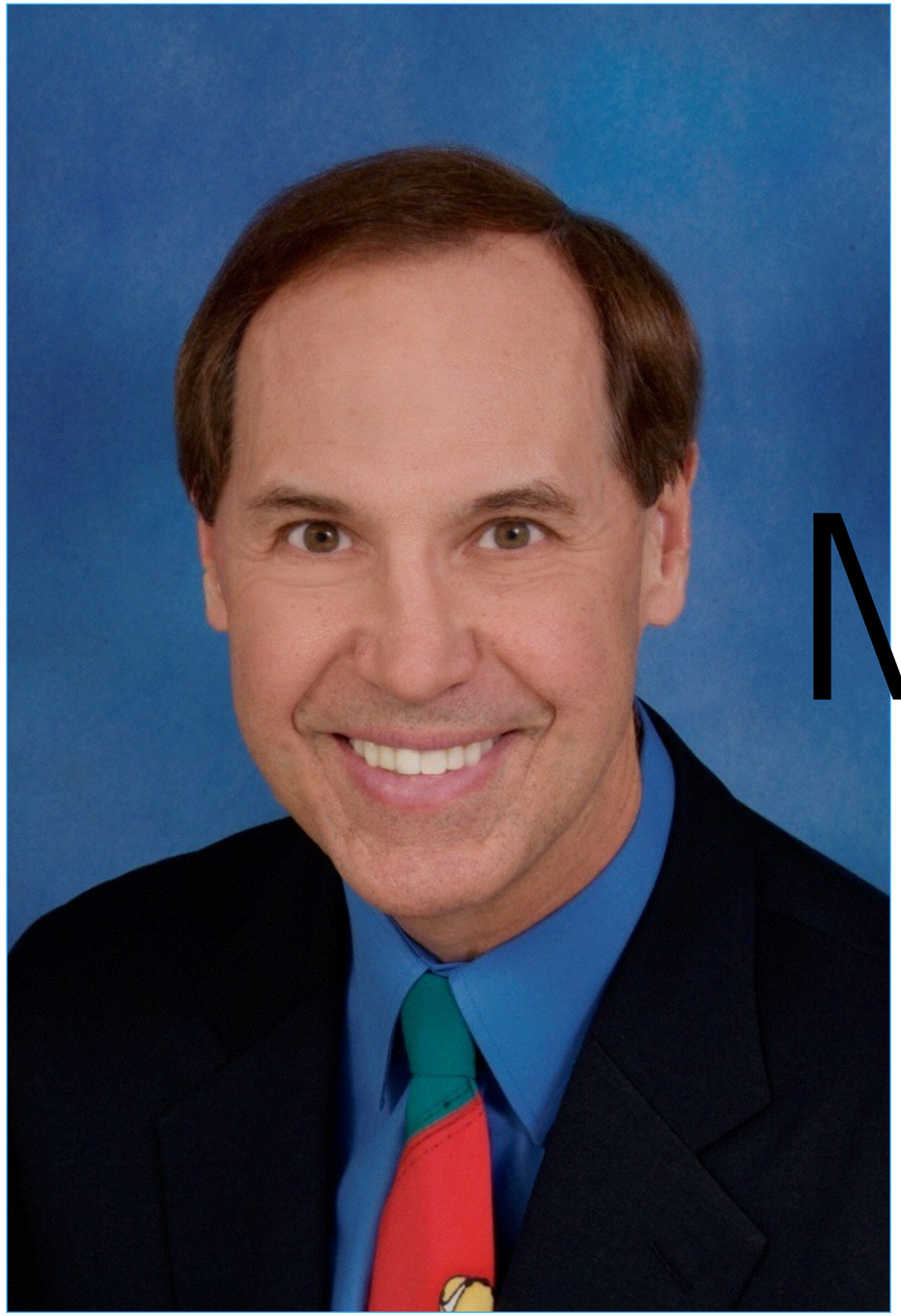

BLAZERS
7





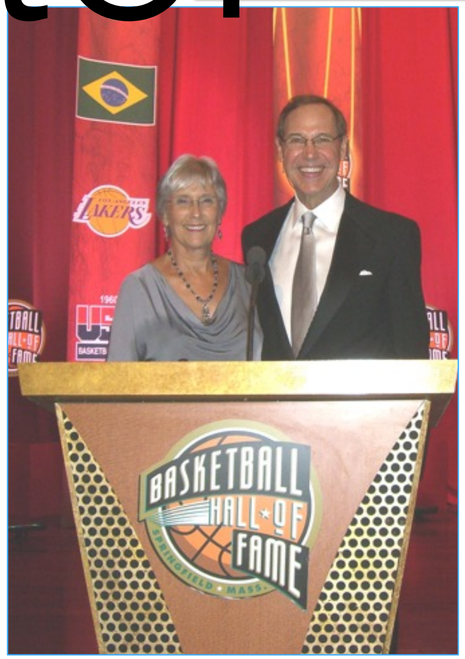


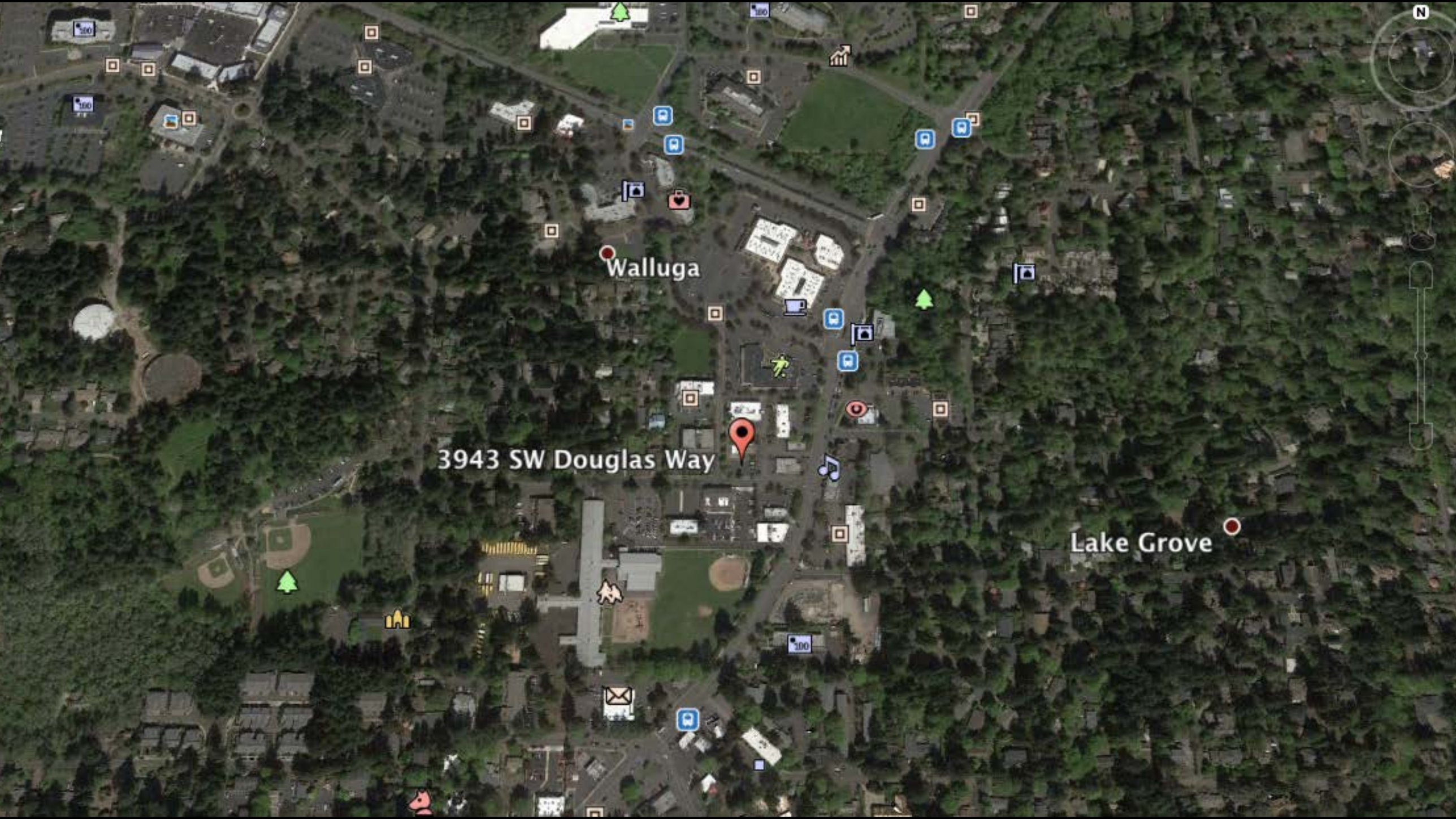


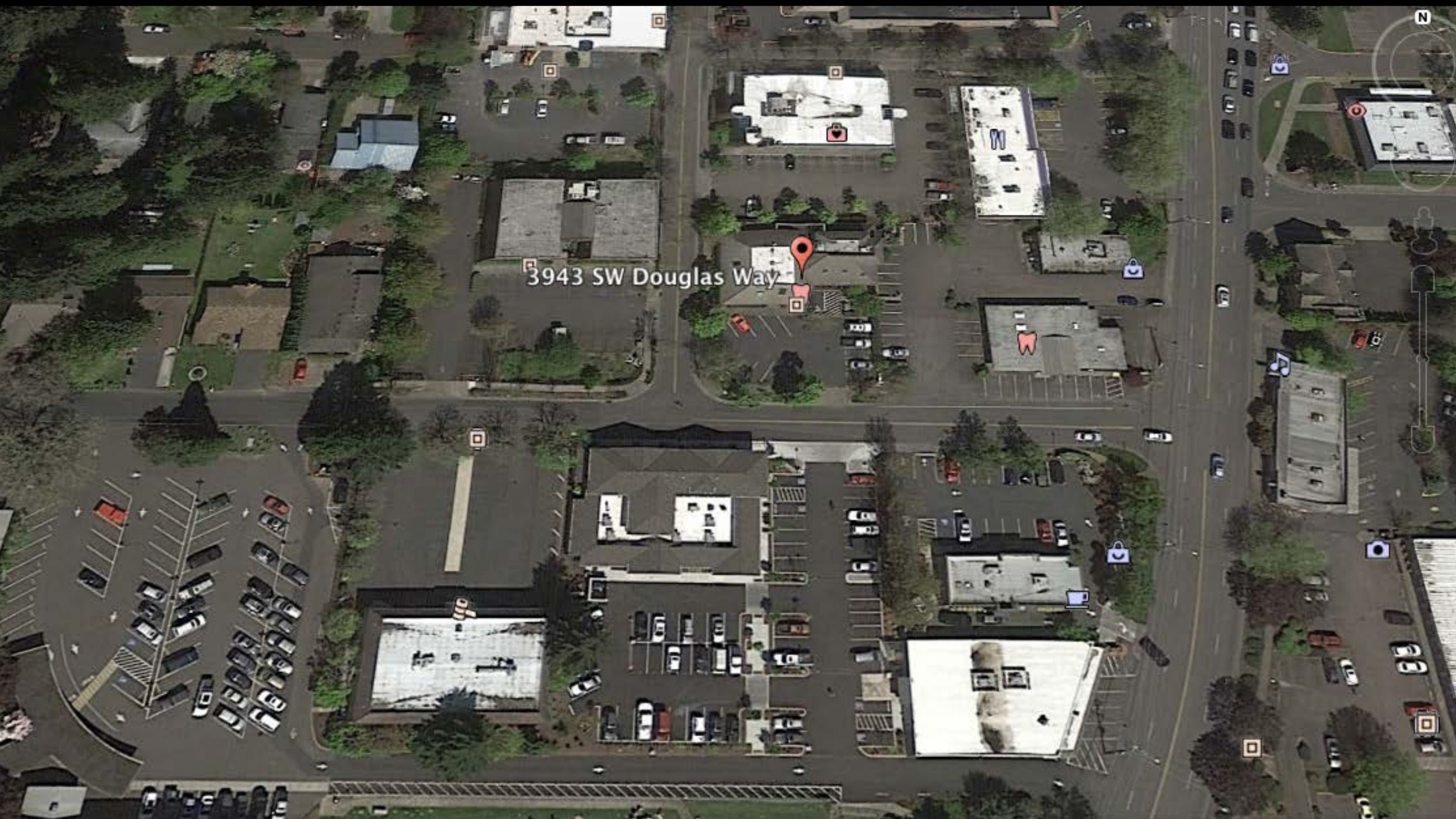


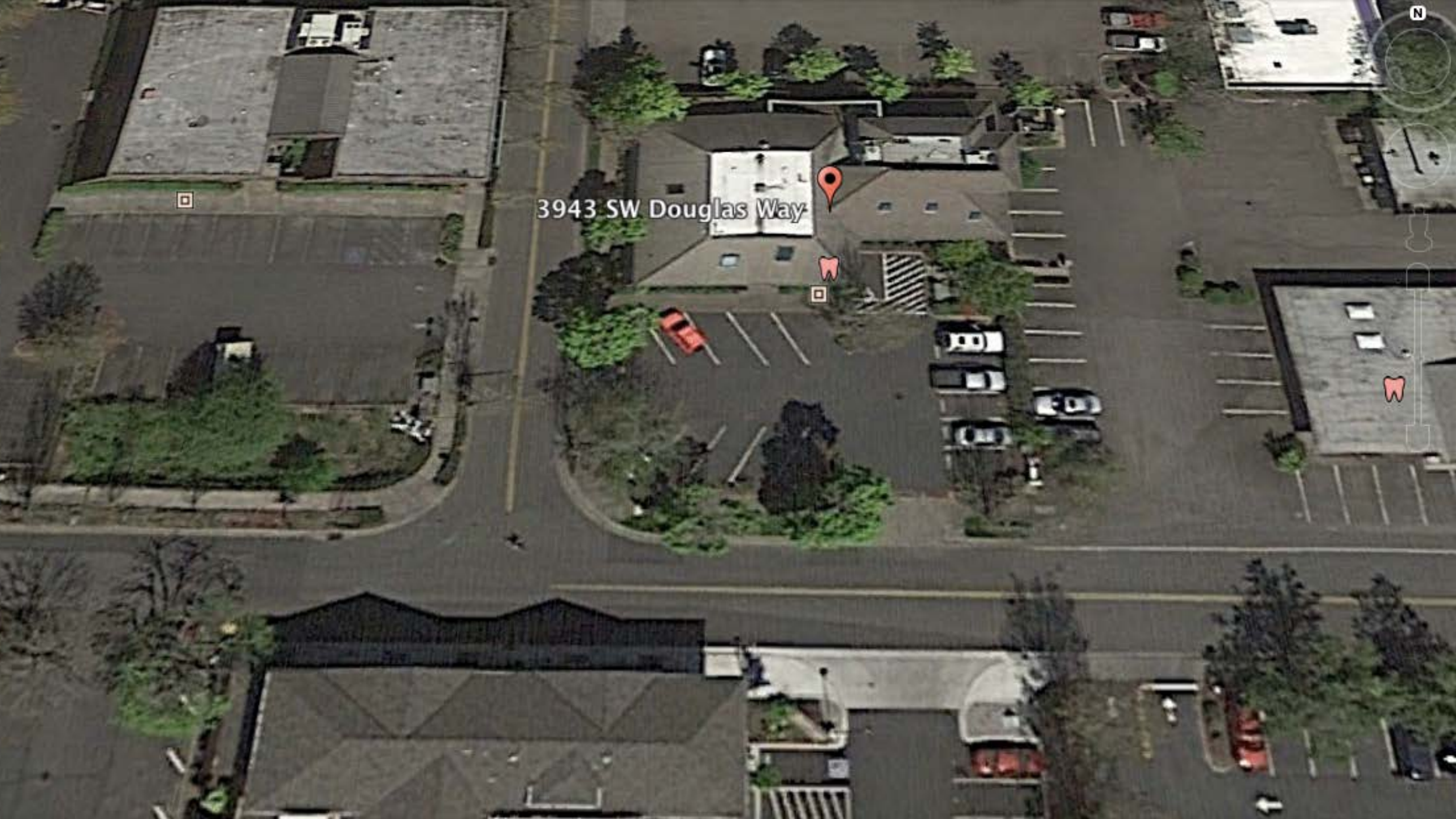
My Mentor






Walluga
3943 SW Douglas Way
Lake Grove
N


3943 SW Douglas Way
N


3943 SW Douglas Way


3943 SW Douglas Way

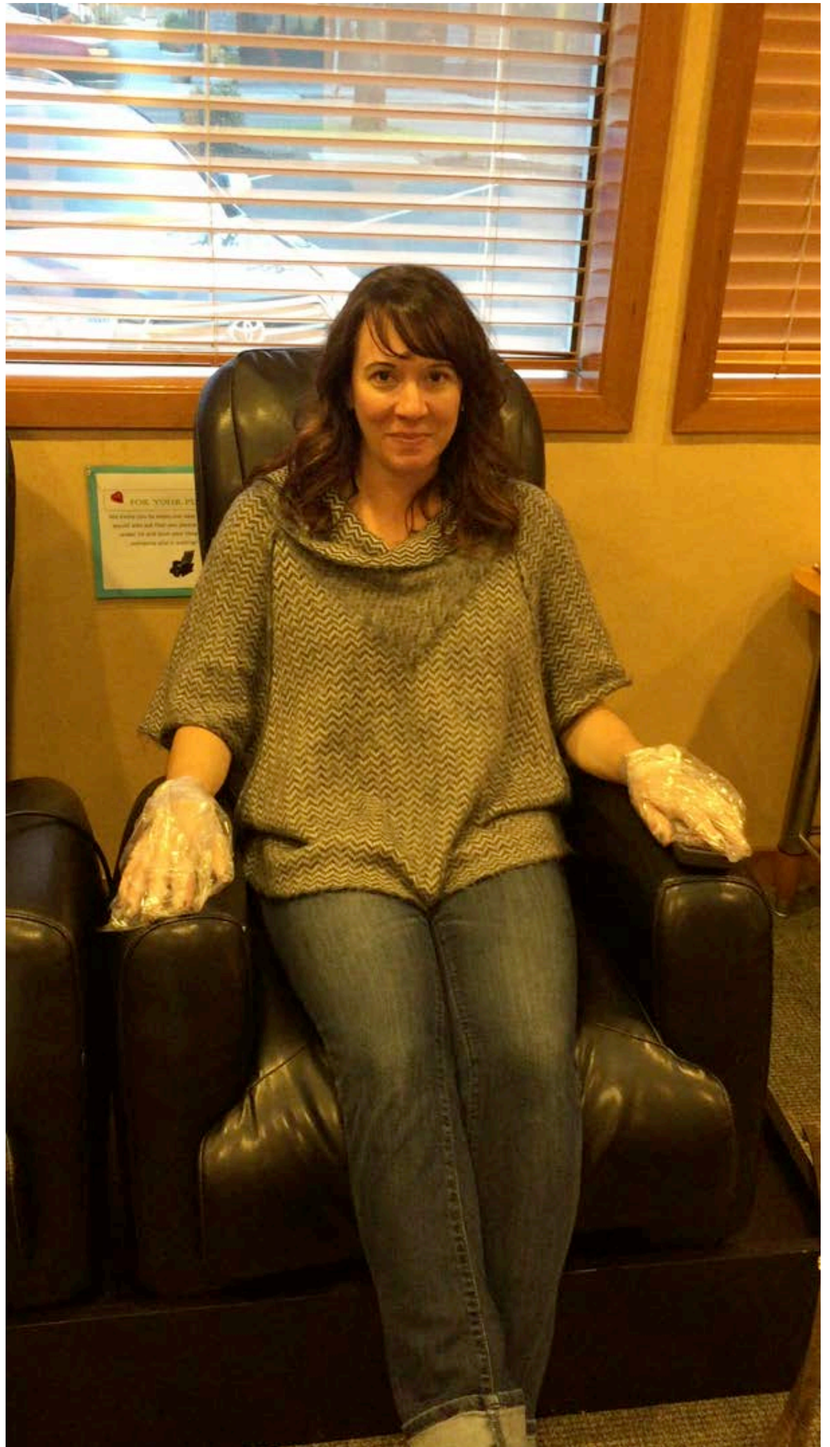

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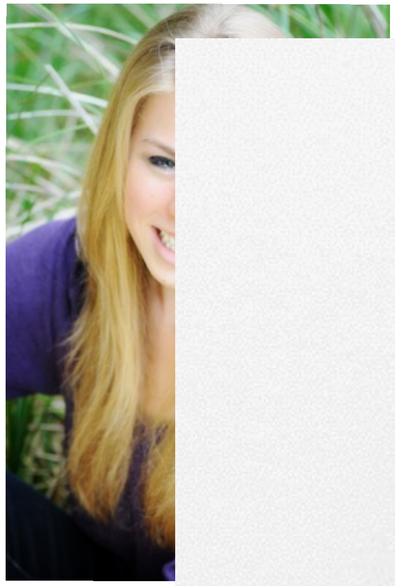

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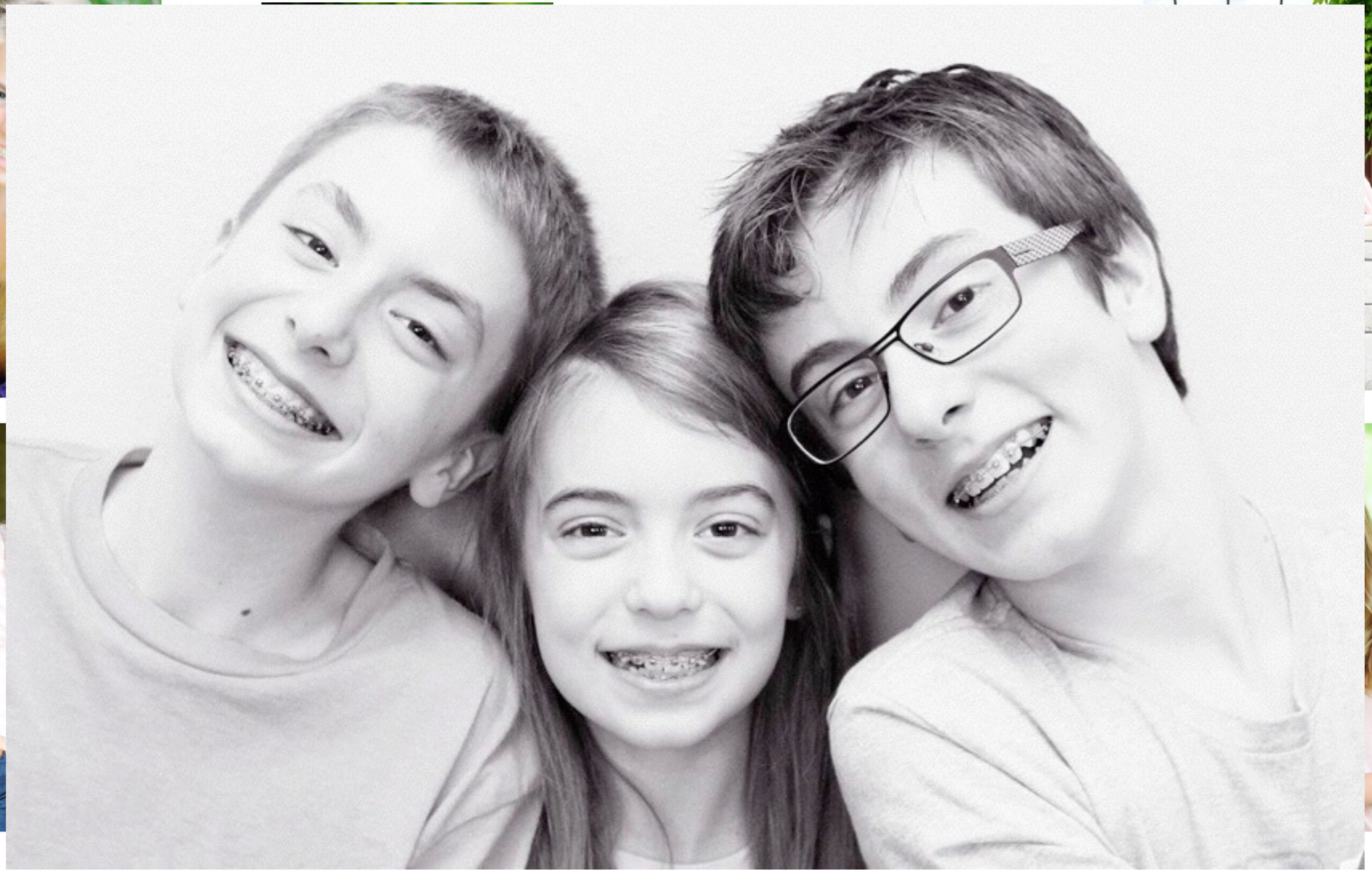

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Available
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drdbraces




32
DUCKS BLVD.

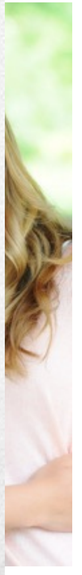












Comfort Zone



Accelerated Orthodontics

Need for Faster Treatment

A UNIVERSITY OF CONNECTICUT STUDY REPORTED THAT
A MAJORITY OF PATIENTS FEEL THAT ORTHODONTIC TREATMENT TAKES TOO LONG*

Source: Fletcher Spaght, 2013, Orthodontic Market Research Survey



7 OUT OF 10 PATIENTS
ARE NOT OFFERED
ACCELERATED TREATMENT BY THEIR ORTHODONTIST

* Uribe F, Padala S, Allareddy V, Nanda R. Patients', parents', and orthodontists' perceptions of the need for and costs of additional procedures to reduce treatment time. Am J Orthod Dentofacial Orthop 2014;145:S65-73.

New Concept?

History of Accelerated Orthodontic Procedures

FORCE MANAGEMENT

Dr. A. M. Schwartz
1932

“Forces as light as 20-26 g/cm2
offer the safest and fastest movements.”

Force Management

- Why lighter forces?
- How much do we need?
- How much moves teeth?

Biozone or Optimal force zone

The level of forces which are high enough to stimulate cellular activity without completely occluding blood vessels in the periodontal membrane.

Treatment goal:
to minimize treatment forces to keep the vascular integrity of the alveolar cortical plate

Force Management
Why light forces?

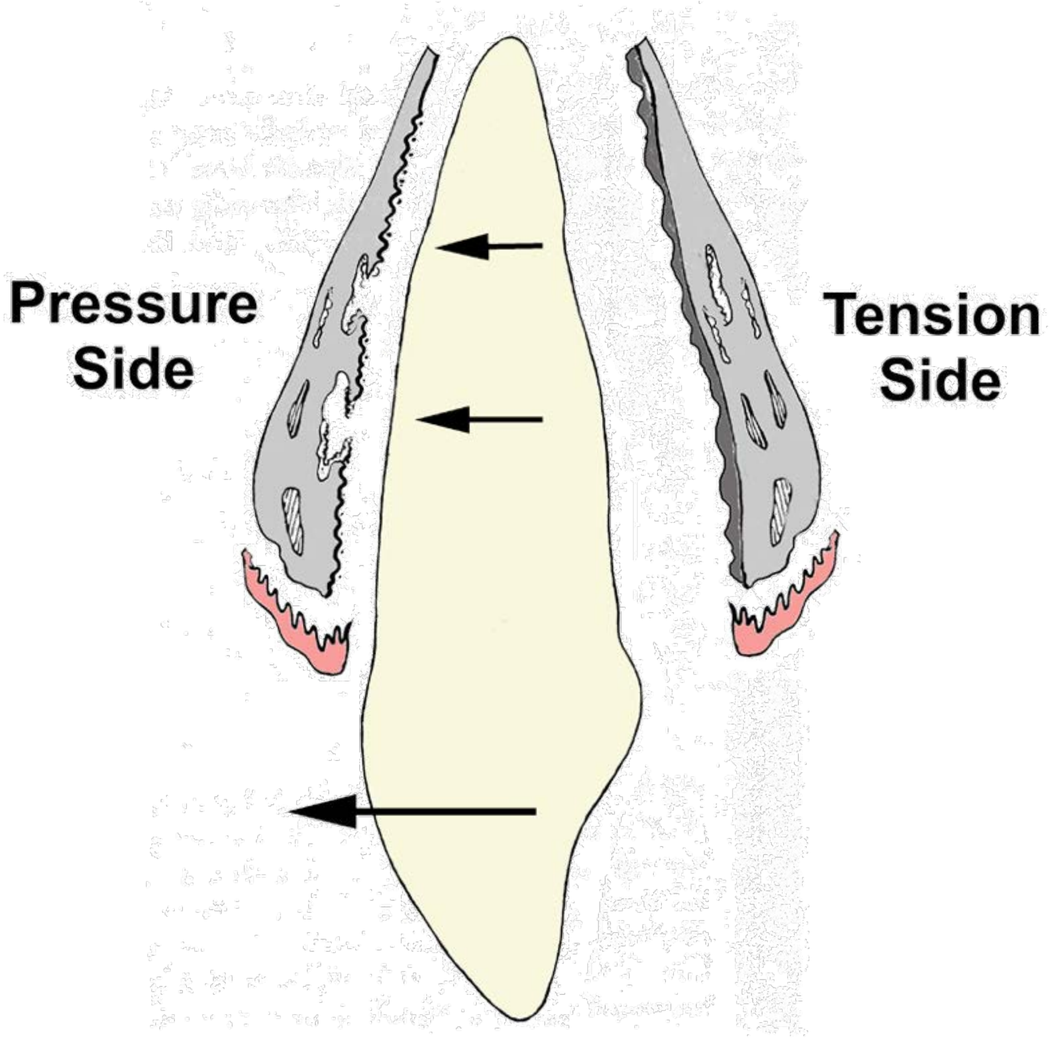
Tooth Movement And Oxygen

- Oxygen is the trigger mechanism for remodeling of the periodontium.
- If vascularity is interrupted in the periodontal space, oxygen is no longer available and cellular activity is slowed or stopped

Force Management

Why light forces?

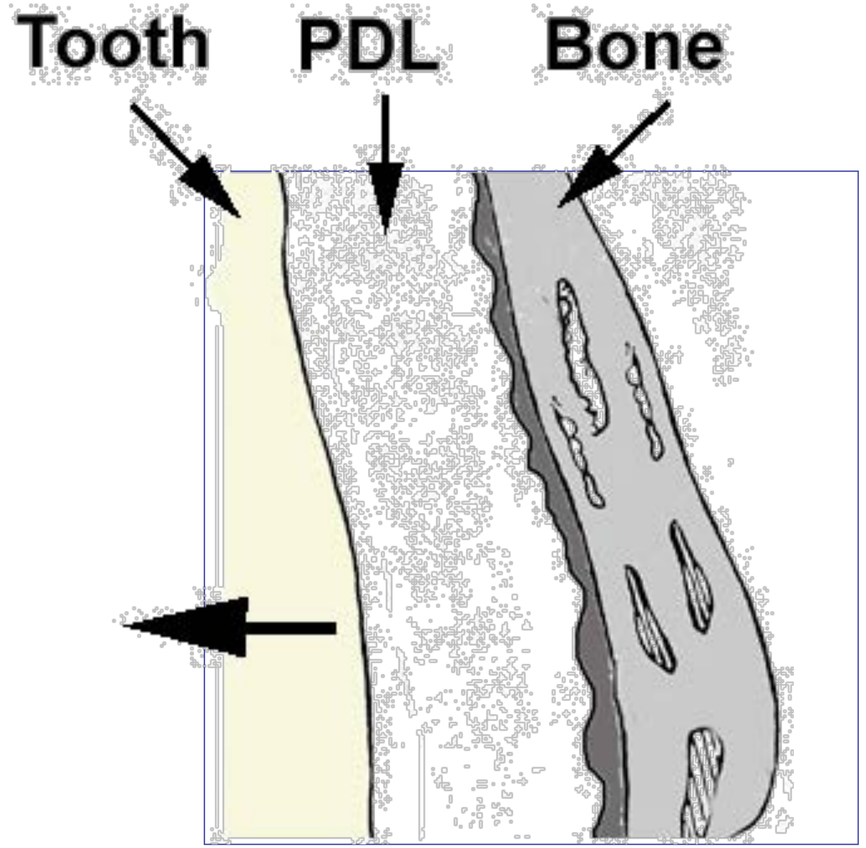
Orthodontic Tooth Movement



Force Management

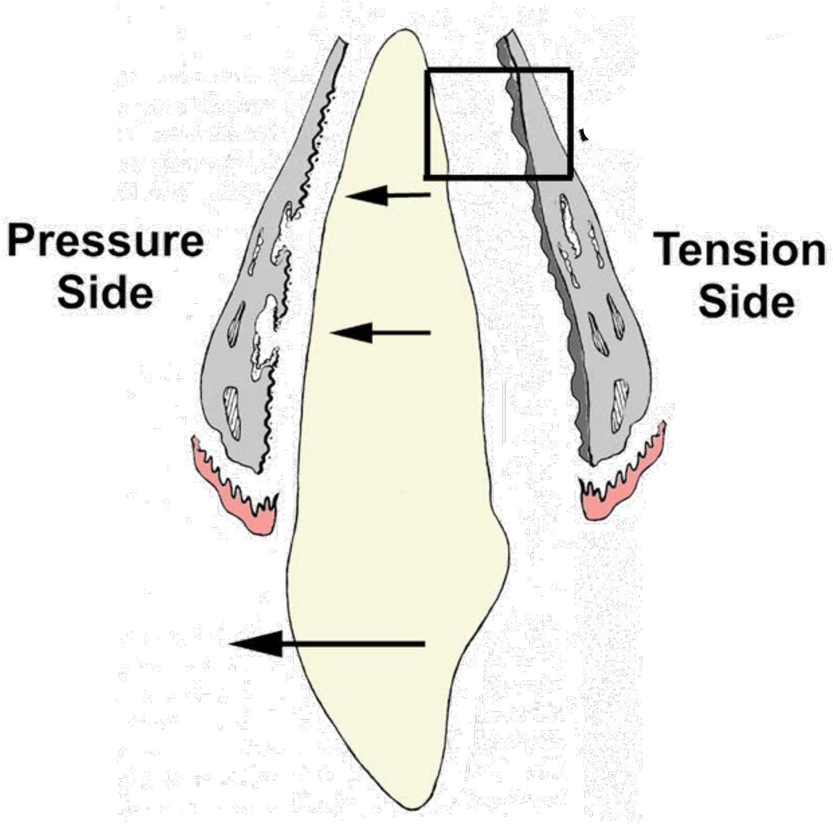
Why light forces?

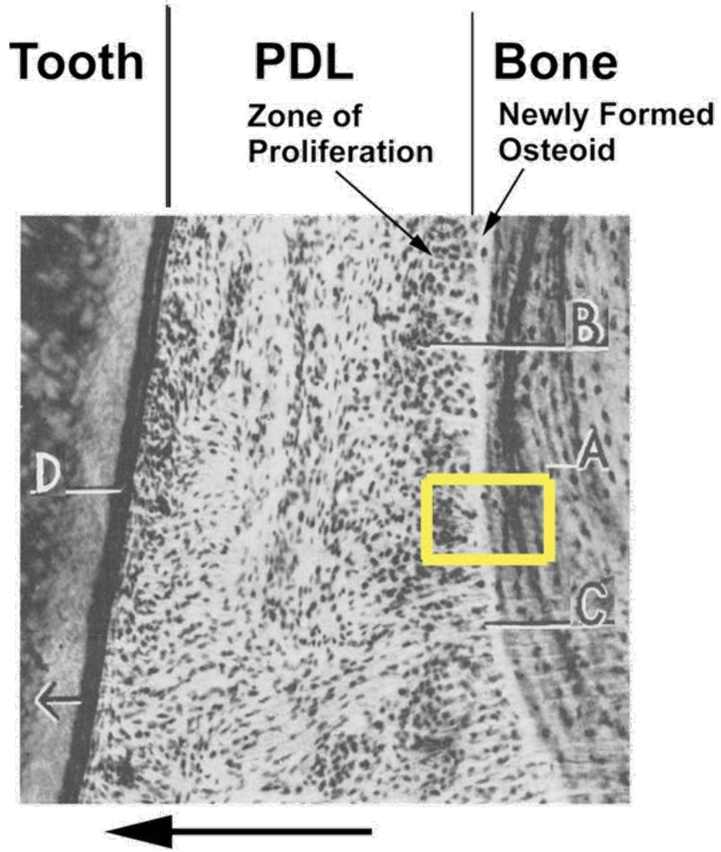
Tension Side



Force Management

Why light forces?





Note the amount of blood flow in the PDL, and concentrated in the area of new bone deposition

Force Management

Why light forces?

Two Distinct Types of Pressure Side Dynamics

1. **Undermining Resorption –**
   Response to Heavy Force

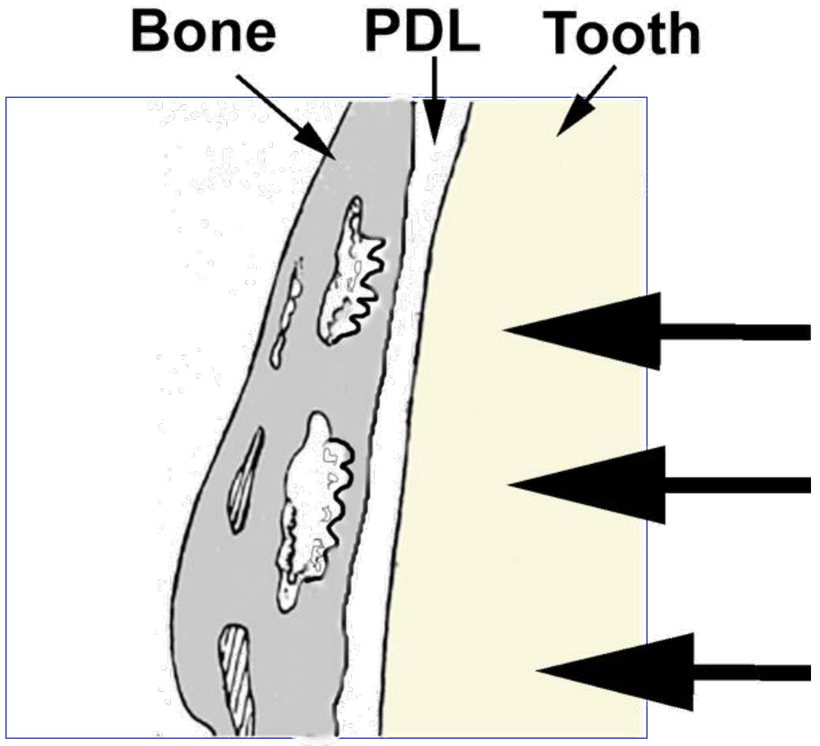
2. **Frontal Resorption –**
   Response to Light Force

Force Management
Why light forces?

Pressure Side

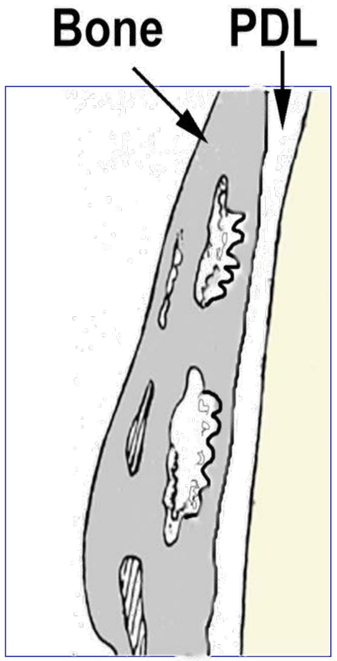
Characteristics of traditional heavier forces

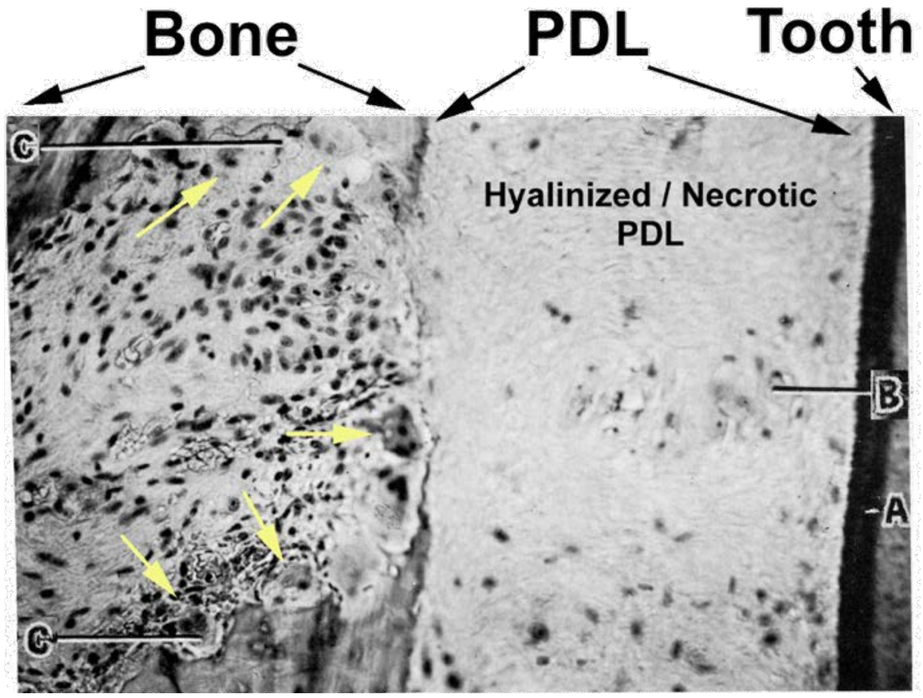
- Crushed Capillaries
- Hyalinized or necrotic zone
- “Undermining resorption”



Force Management
Why light forces?

Pressure Side
Traditional Heavy Forces





Note how little blood flow there is in the necrotic PDL, and how much bone must be eroded to cause movement with undermining resorption

Force Management

Why light forces?

It appears that
the vascularity of alveolar
bone changes following the
use of very high clinical
forces.

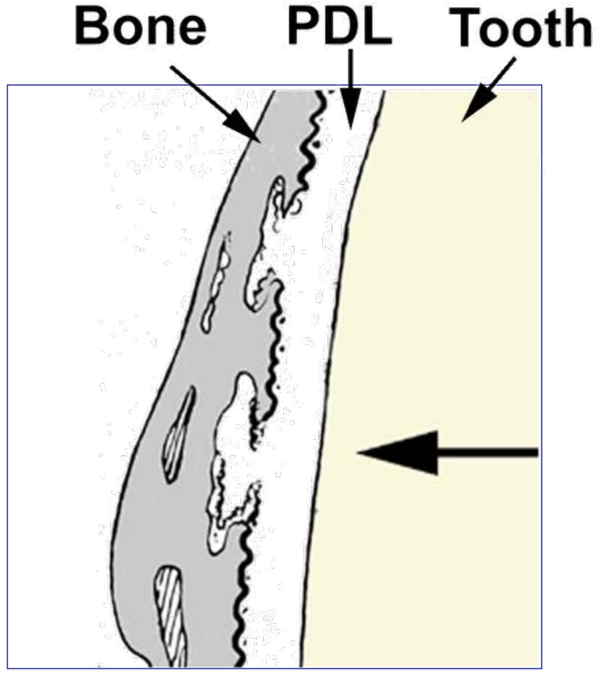
Force Management

Why light forces?

Pressure Side

Characteristics of Light Forces

- Mildly compressed capillaries
- Osteoclastic activity
- “Frontal resorption”

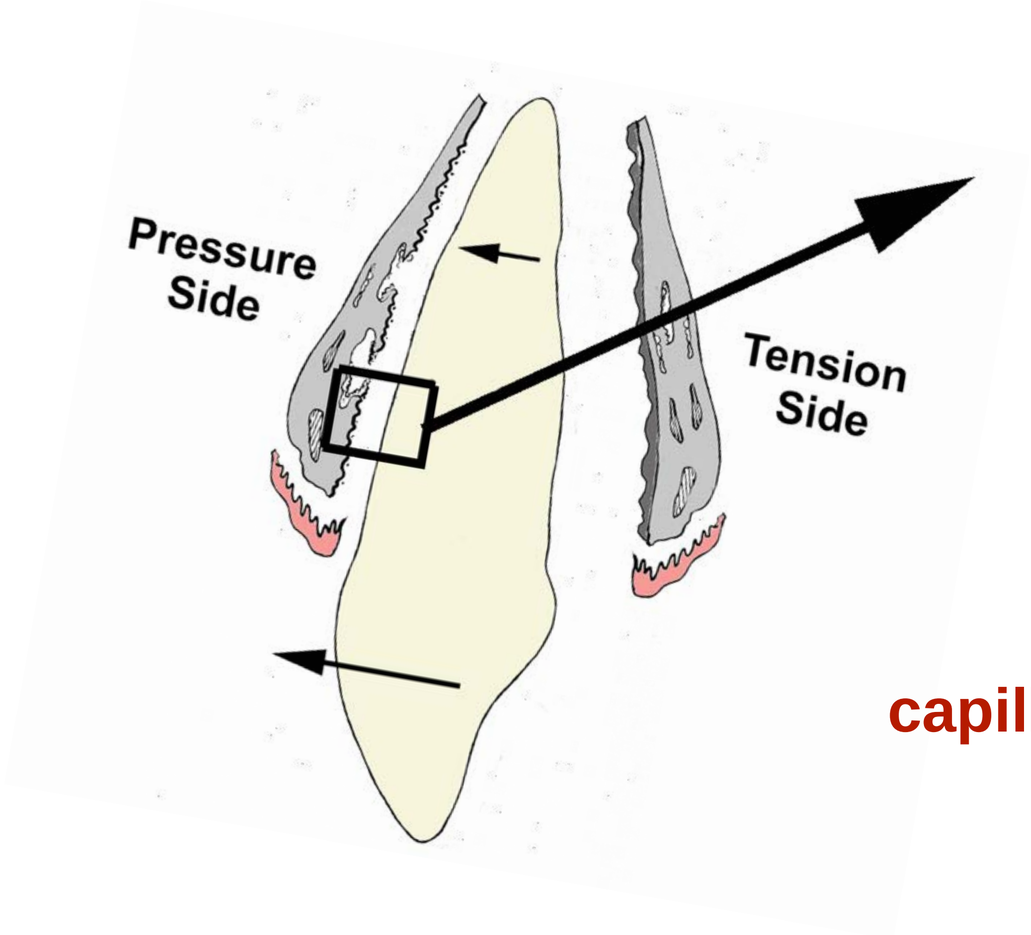


Force Management

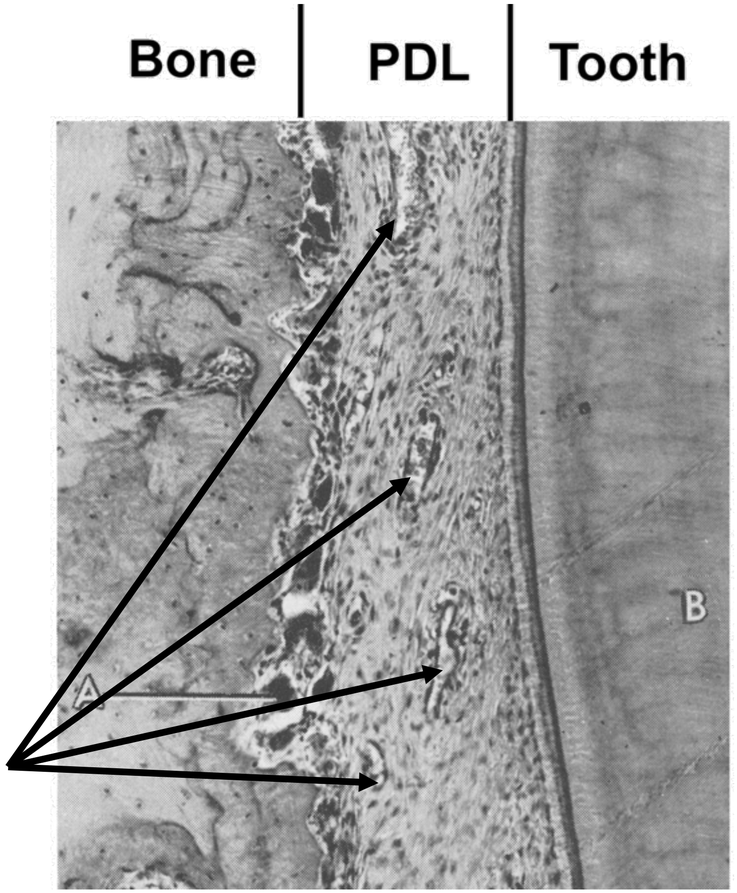
Why light forces?

Pressure Side

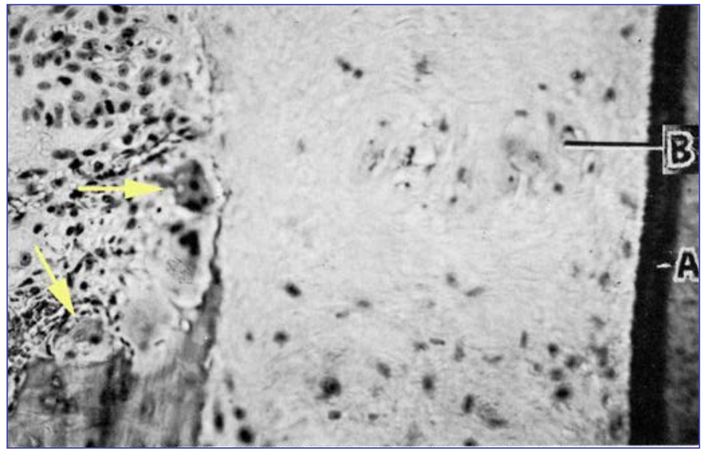
Characteristics of Light Forces



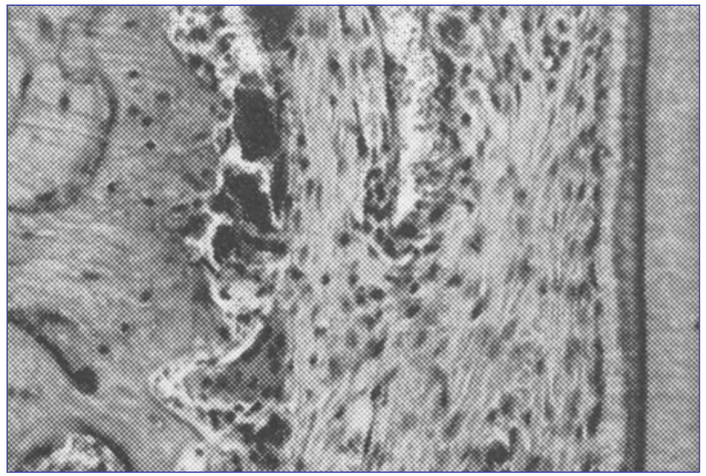
capillaries



Force Management
Why light forces?



Conventional forces with necrotic PDL



Low forces with vascular PDL

"Light continuous forces ensure more effective tooth movement in areas with *cortical bone or bone with few marrow spaces*. Use forces that do not interrupt the vascular supply."

– Rygh

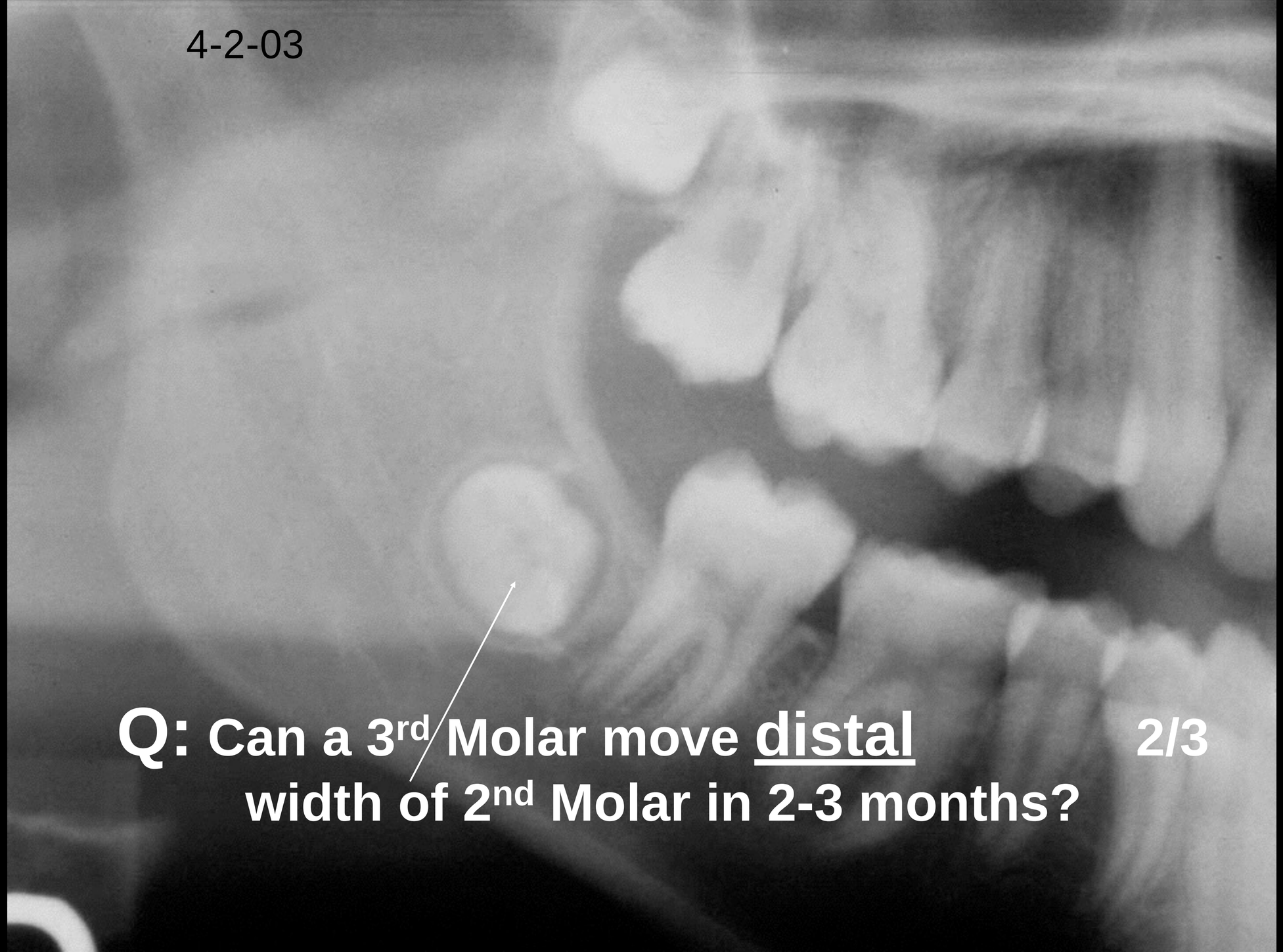
Force Management

How much do we need?

An extreme example of how low levels of force can make significant changes in tooth positions

Images provided by Dr. Clark Jones, Phoenix, AZ

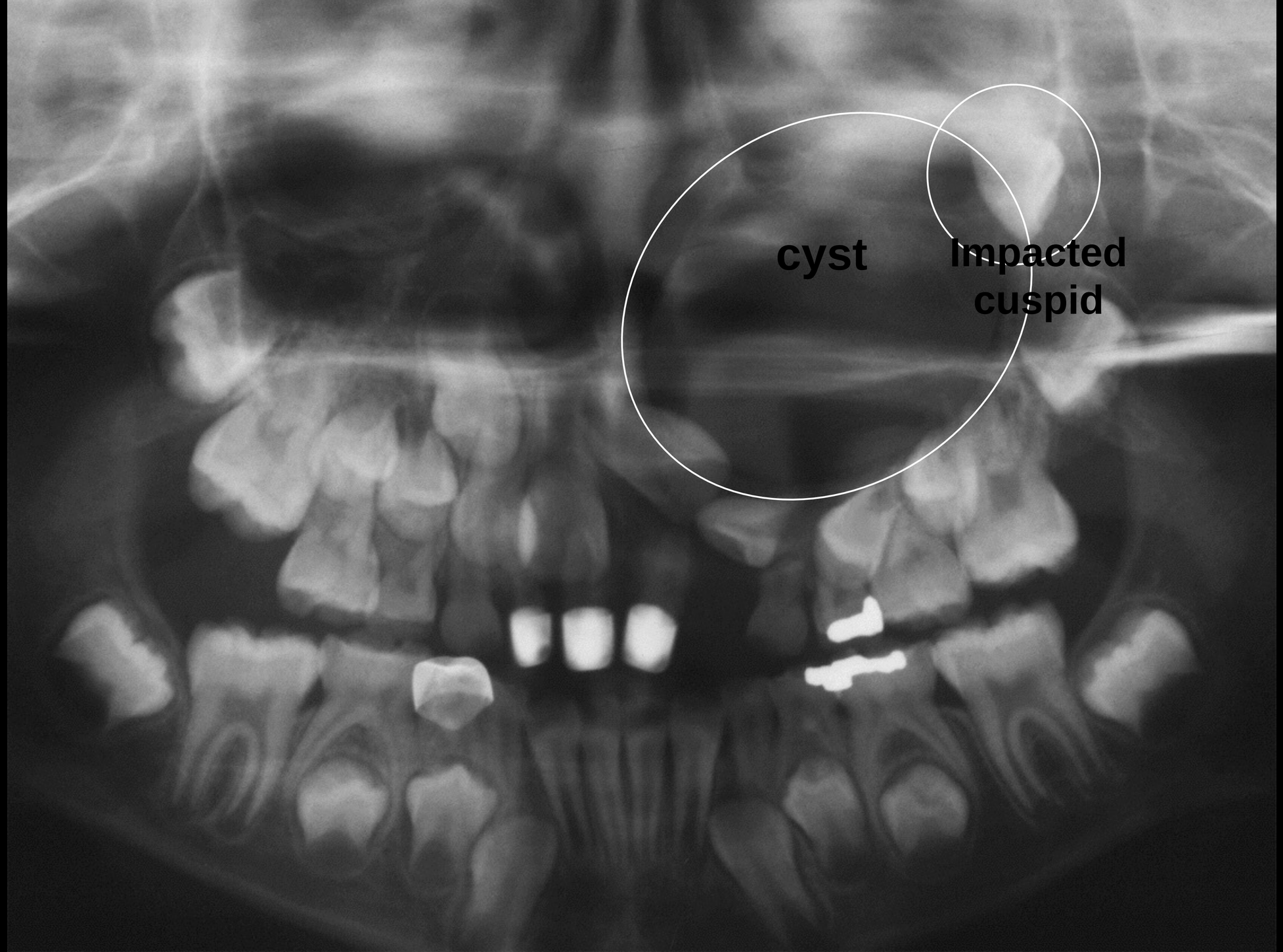
4-2-03



Q: Can a 3rd Molar move distal **2/3**
width of 2nd Molar in 2-3 months?



A: It can when there is a cyst growing…

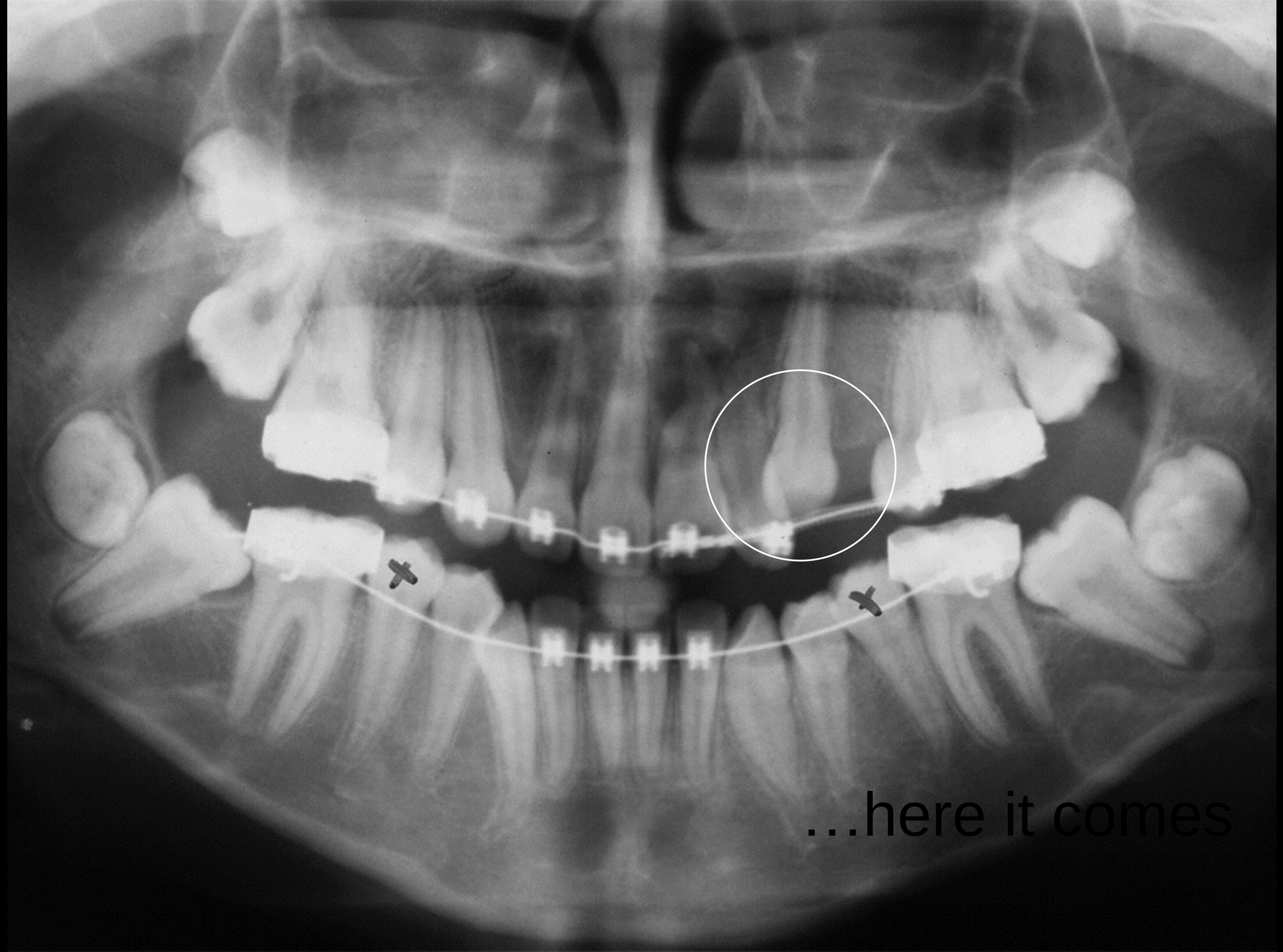

cyst
Impacted
cuspid

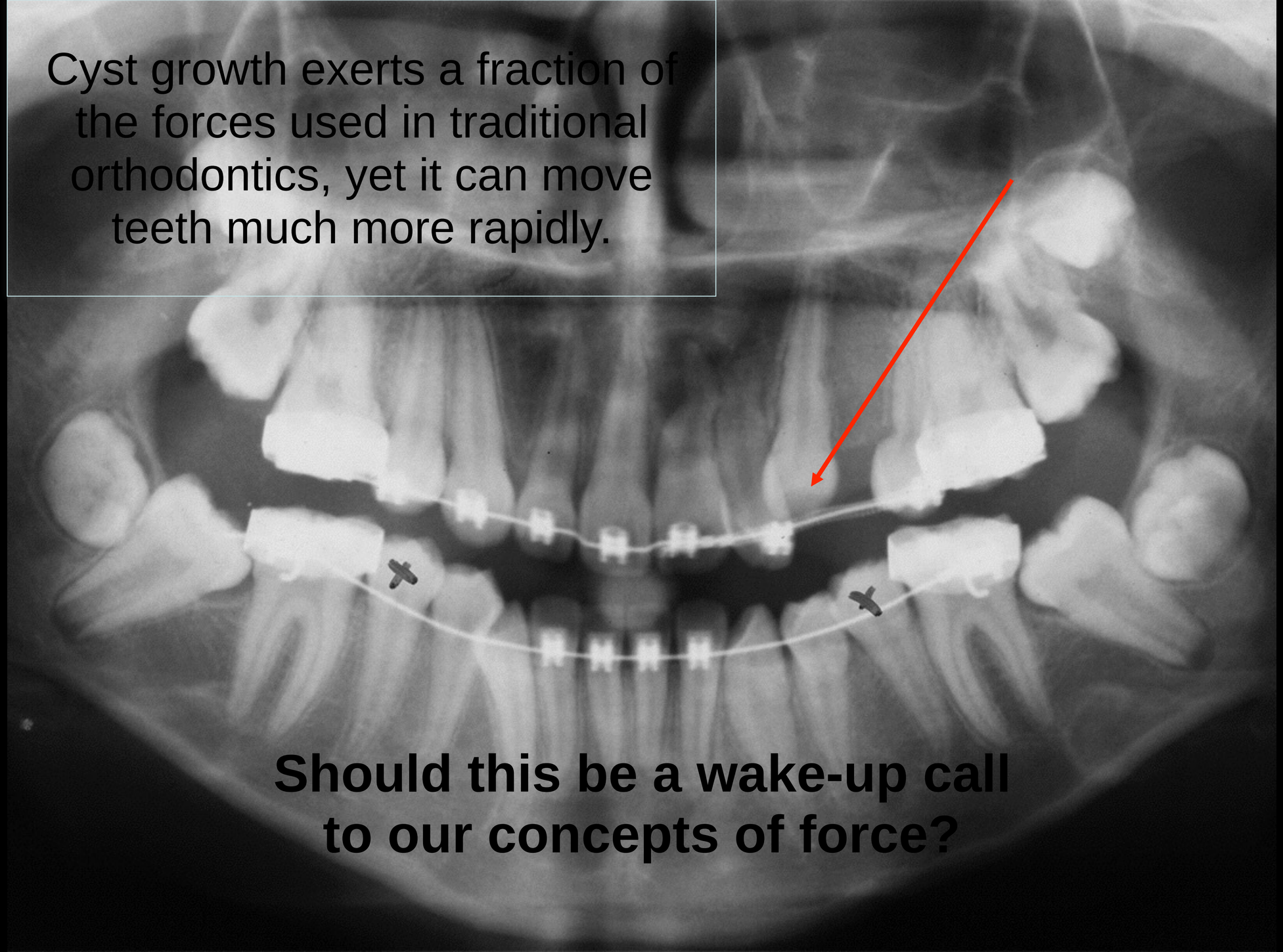


With the cyst removed,
the cuspid starts its path…


…Here it comes


…It’s coming


…here it comes


Cyst growth exerts a fraction of the forces used in traditional orthodontics, yet it can move teeth much more rapidly.
Should this be a wake-up call to our concepts of force?

Light Forces Move Teeth Faster

1988

WILCKODONTICS®

ORTHODONTIC SYSTEM




A


B





1997

Passive Self Ligating Braces

Allowing Lower Forces to be Used





Force Management

How much do we need?

Passive Self Ligation allows
us to more closely mimic
low biological forces than any other
systems in use today and The Damon
System is the best available in my opinion.

Q: Why is low-friction so important?

A: By significantly reducing friction, we can now use “biologically sensible” forces with superior results

How Do PSL Brackets Allow Clinicians to Deliver Lower Forces?

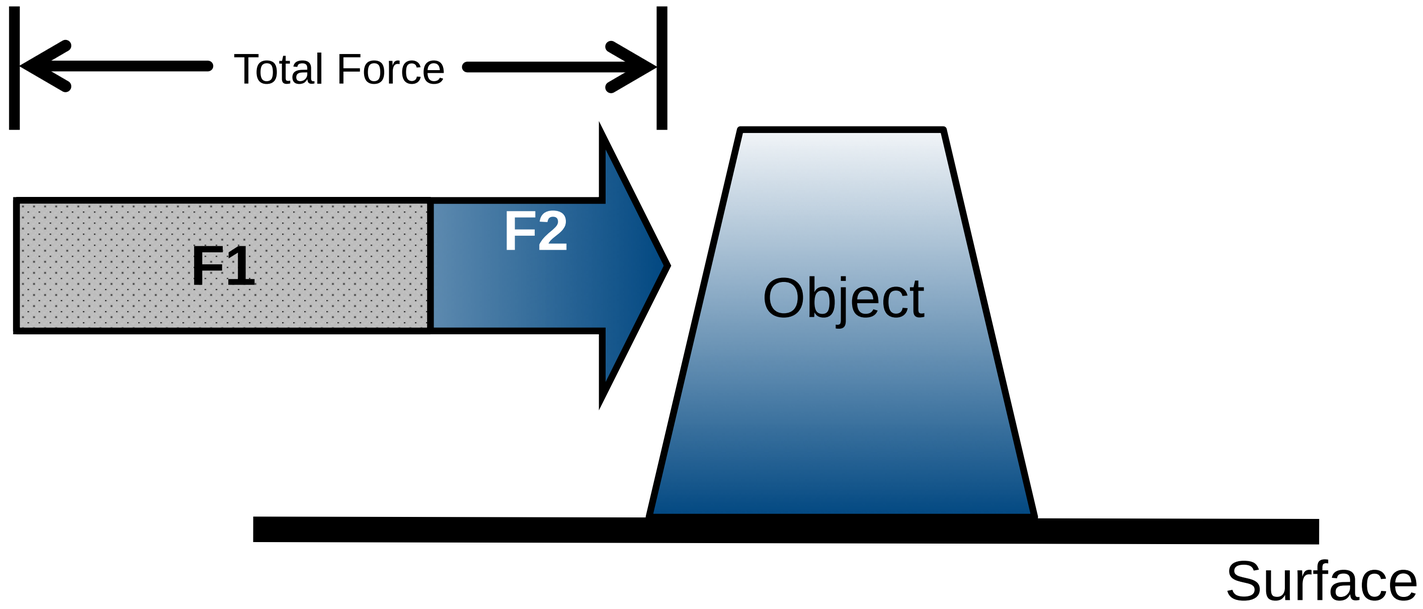
By Greatly Reducing

- Ligation friction
  - No elastic or SS ties or impinging clip
- Binding friction
  - Large tube (.022 x .028)

Friction Equals Resistance

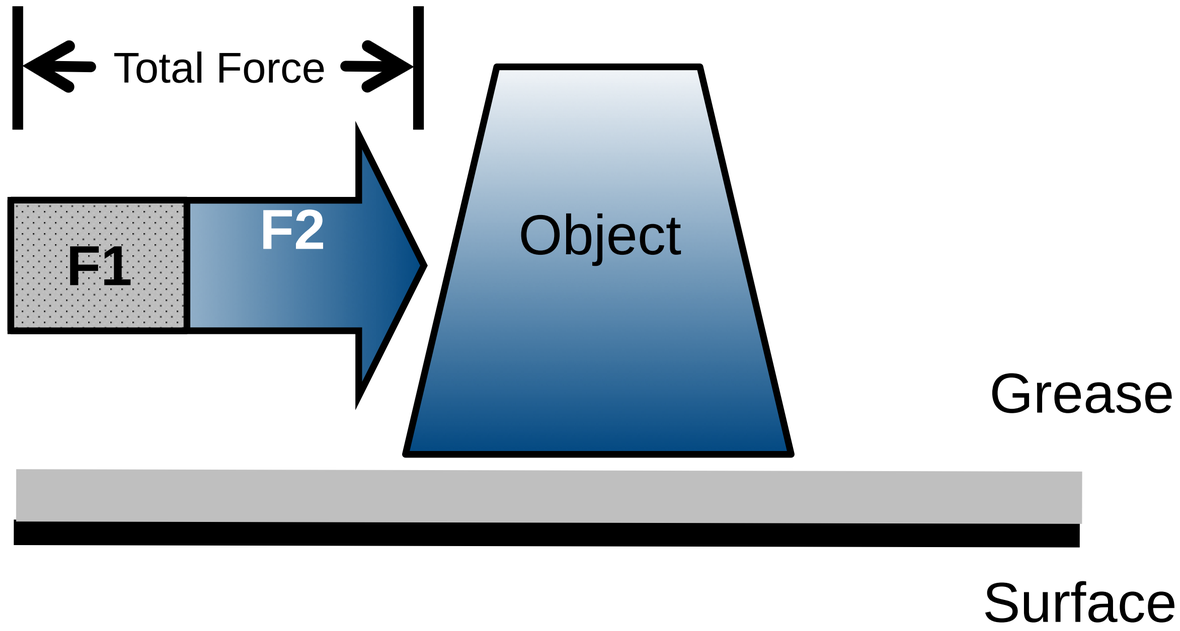
To Movement

This occurs between two surfaces in contact when there is relative motion between the two.

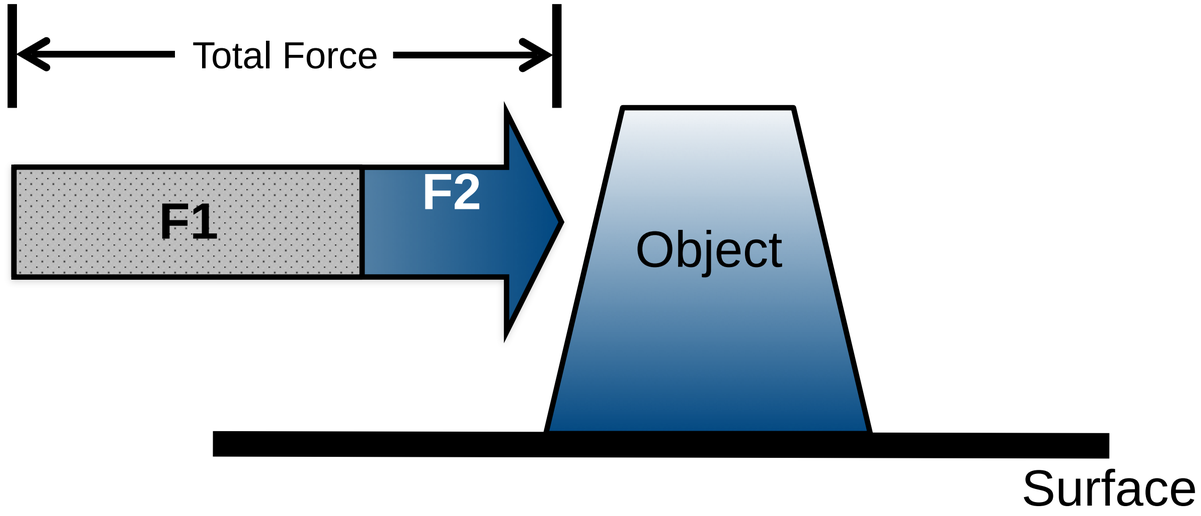


F1: Force to overcome resistance

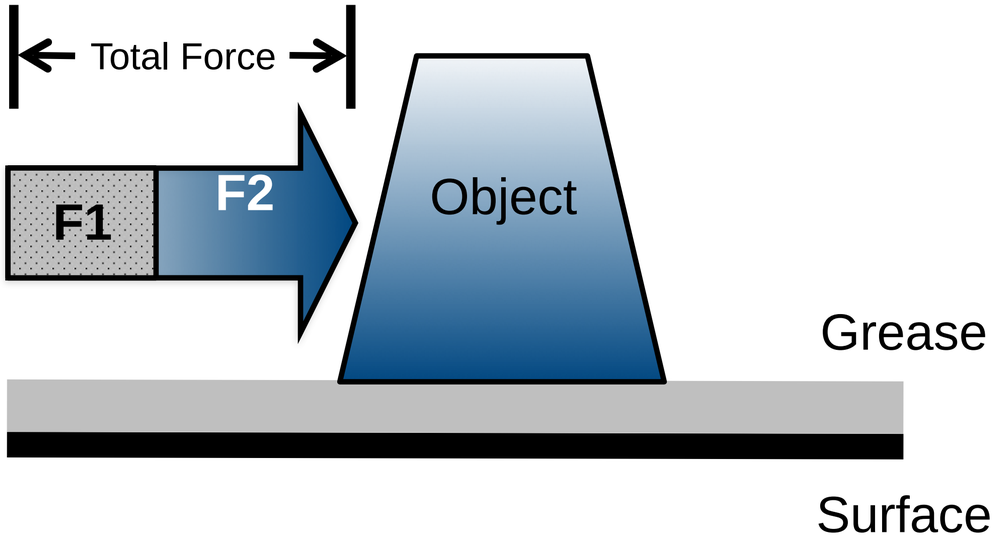
F2: Force to move object



F1: Force to overcome the resistance is greatly reduced. Therefore, the total force is greatly reduced.

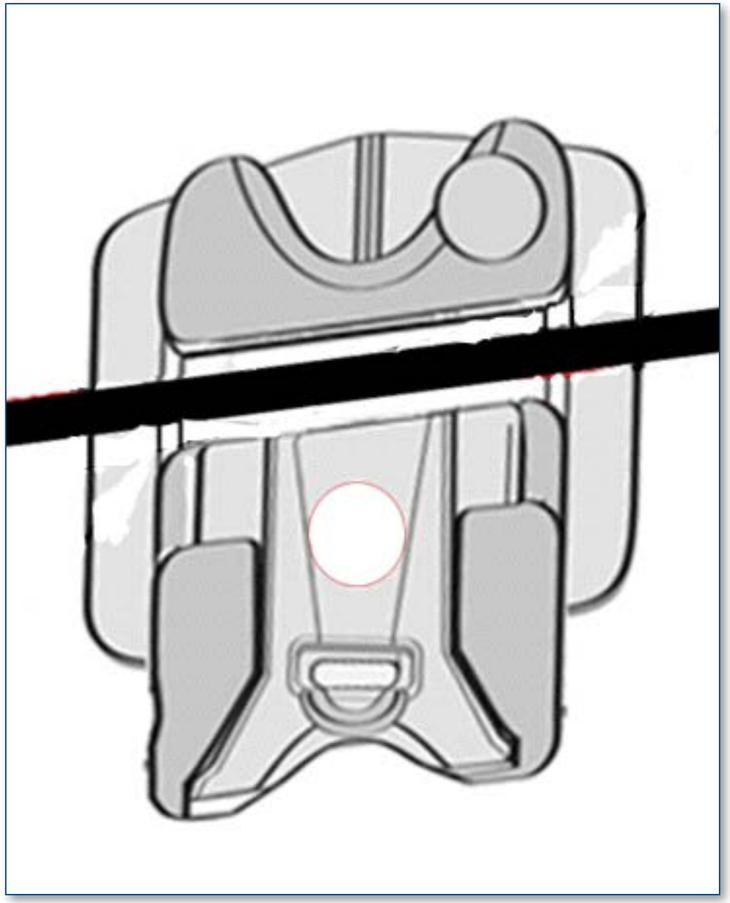

Total Force
F1
F2
Object
Surface

Compare


Total Force
F1
F2
Object
Grease
Surface

In Orthodontics, the Two Surfaces in Contact are:

- The bracket slot
- The wire
  - When teeth move the brackets slide along the archwire.



Ligation Friction

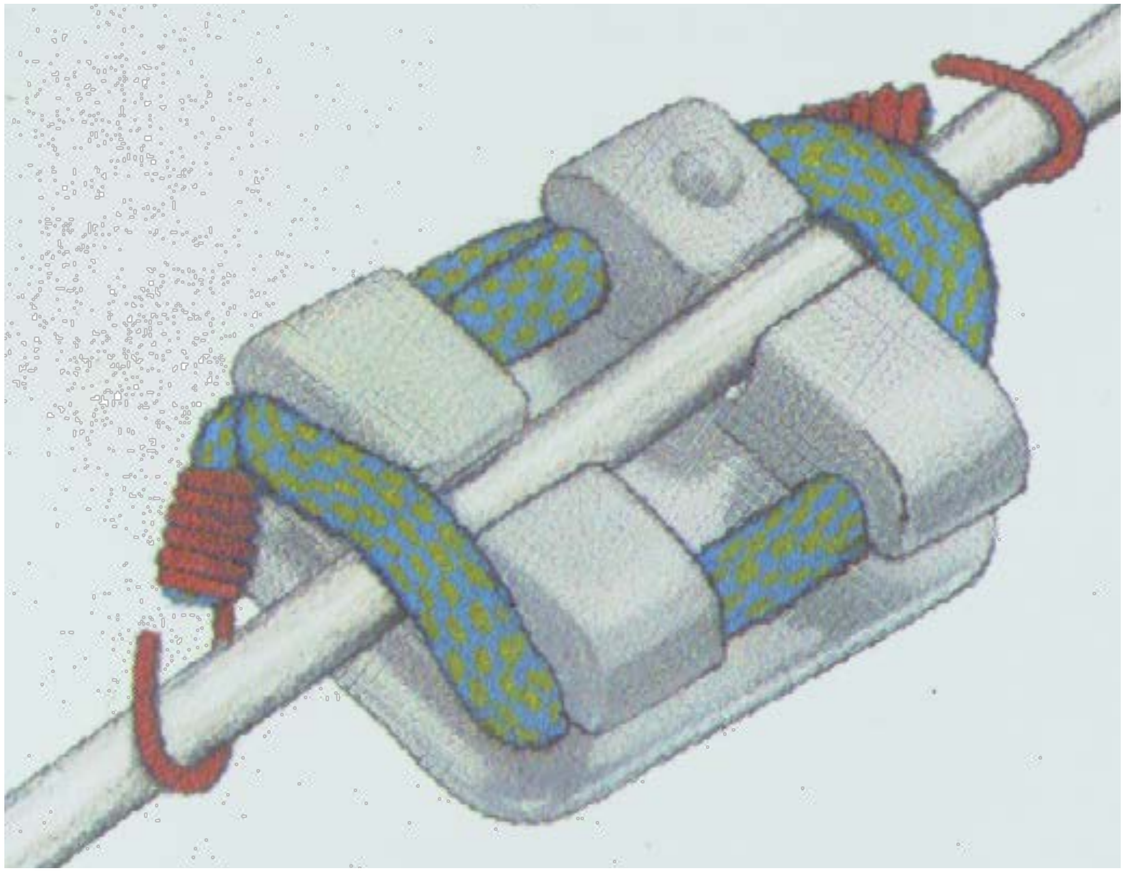
Damon Difference

Passive self-ligation

 # 1 enemy of traditional clinical orthodontics is the way archwires are tied !!

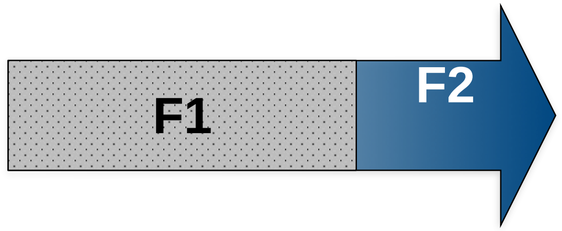
Damon Difference

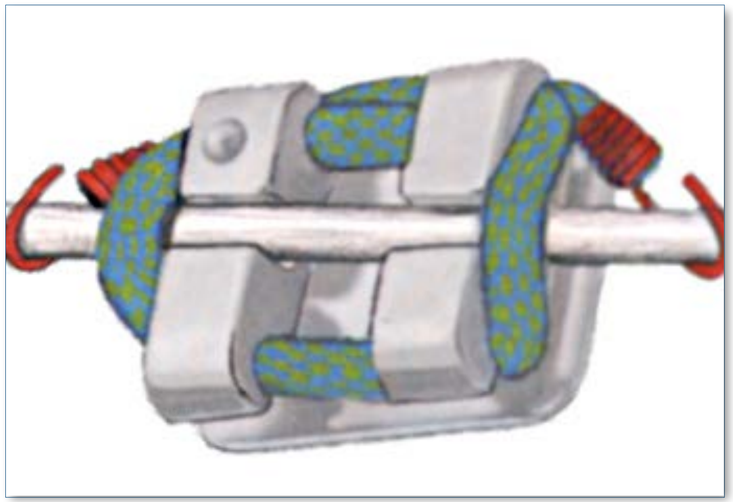
Passive self-ligation



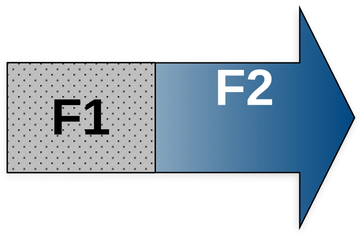
Bungeedontics

Elastomeric Ligation





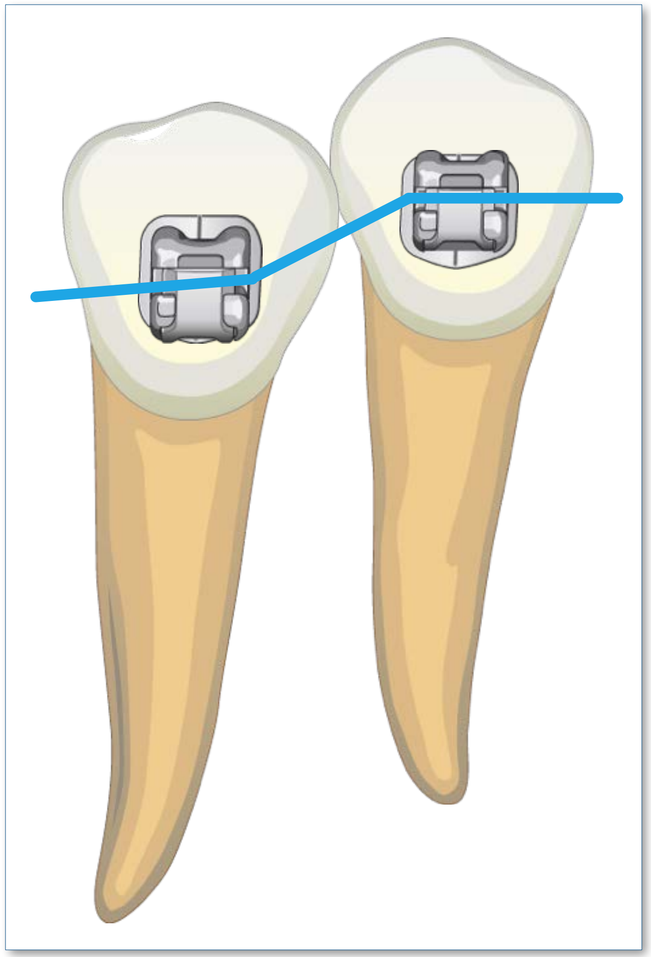
Passive Self-Ligation





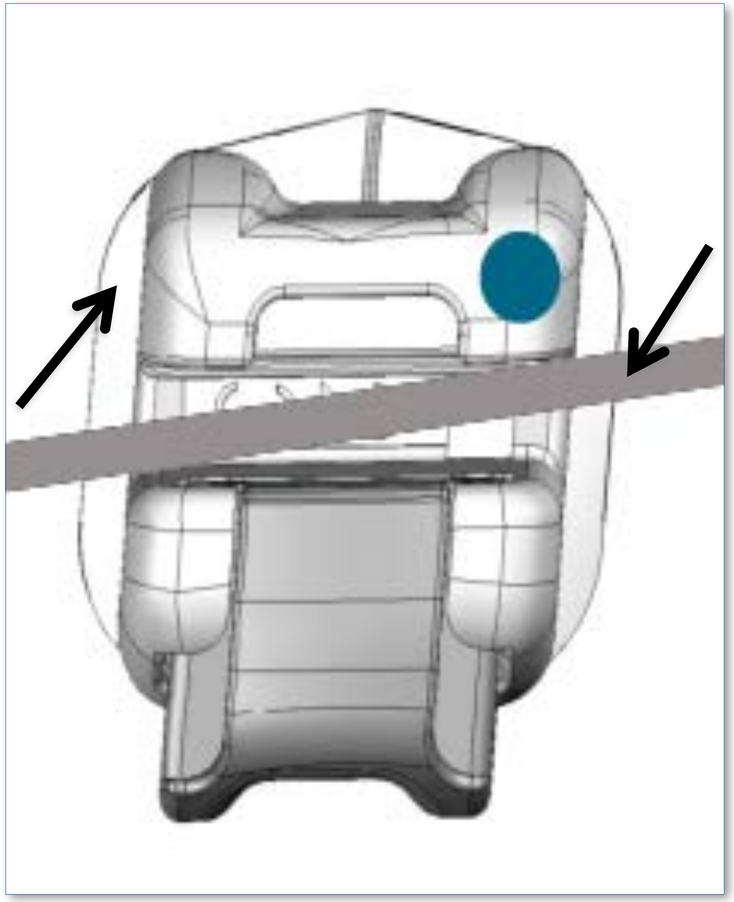
Binding Friction

Consider two adjacent teeth at the beginning of treatment and how the archwire must be deflected to engage each bracket.



- The critical contact angle for binding occurs when the wire is deflected to the point of initial contact with the opposing sides of the bracket slot.

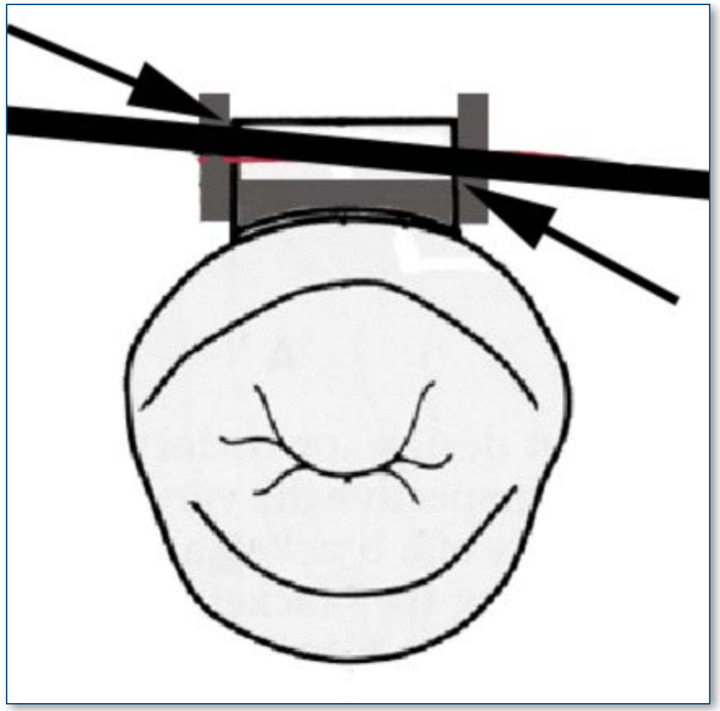
- Binding increases as this angle is exceeded.



The critical contact angle for binding is reduced with smaller diameter archwires in a larger tube/slot.



Occlusal Perspective



Critical contact angle
for binding

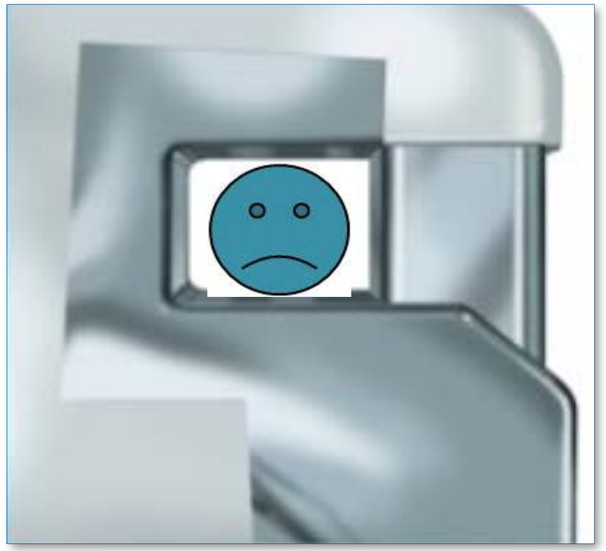


Critical contact angle
reduced with
smaller diameter wire

Large Lumen Bracket Slot and Small Diameter Wire

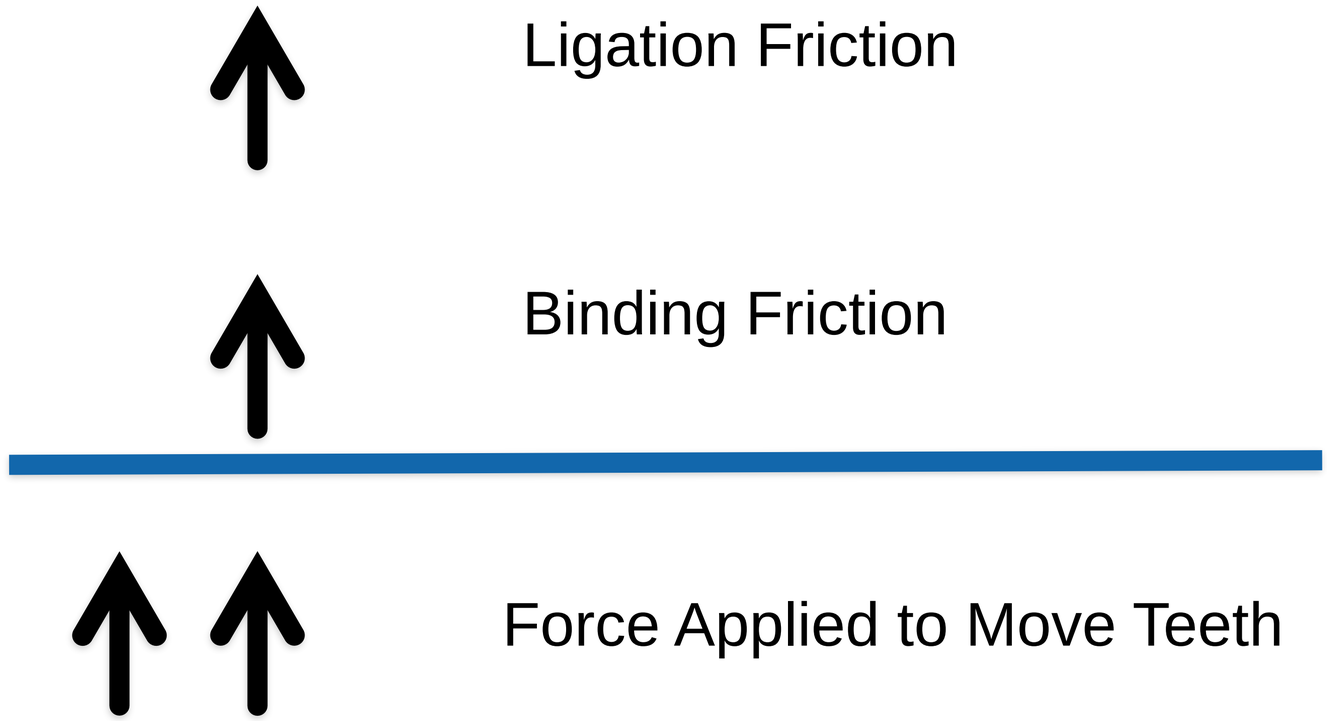
- Passive self-ligation principle
  - The initial archwires are carefully selected to minimize binding friction between the tube of the passive ligating bracket and the archwire. This allows sliding of the teeth and brackets along the wire as they start to level and align.



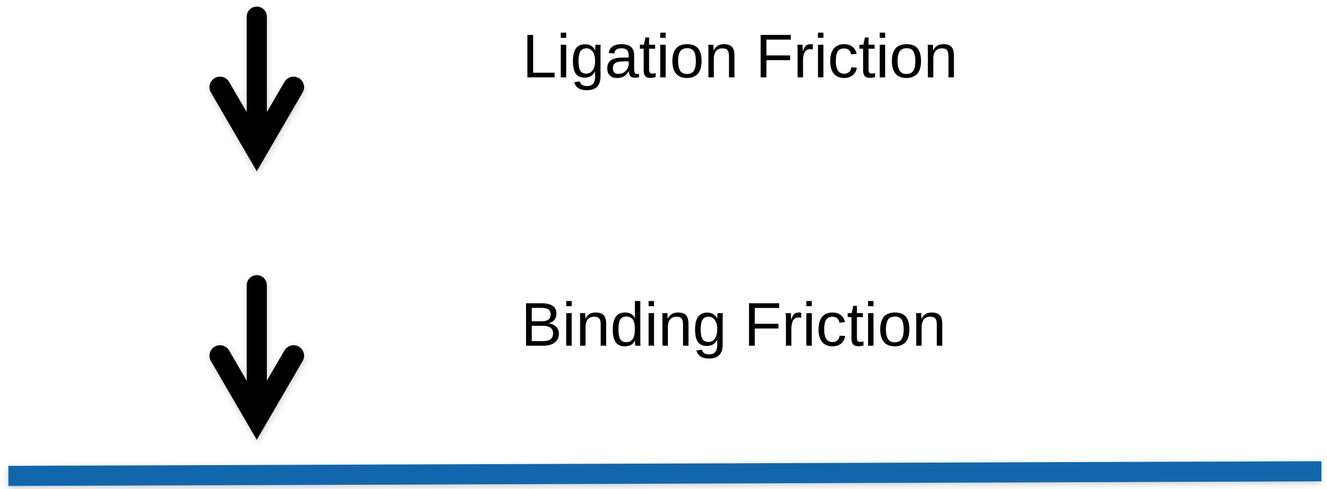


In TRADITIONAL ORTHODONTIC MECHANICS, In Order to Overcome Ligation Friction and Binding Friction, Extra Force Must Be Applied to Move the Teeth.

TRADITIONALLY LIGATED BRACKETS

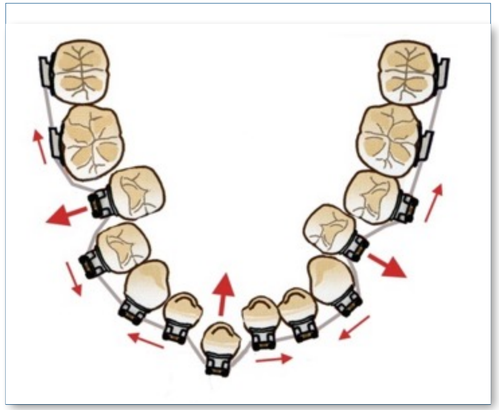


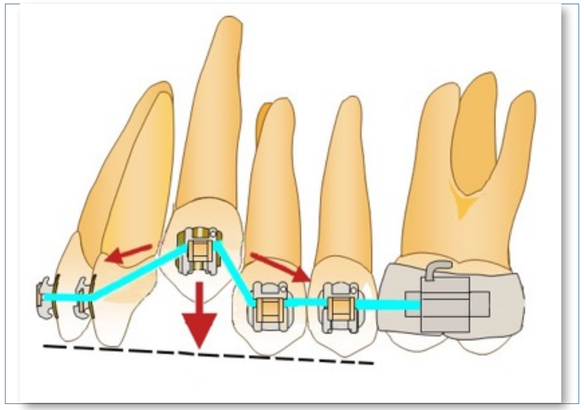
PASSIVE SELF LIGATED BRACKETS

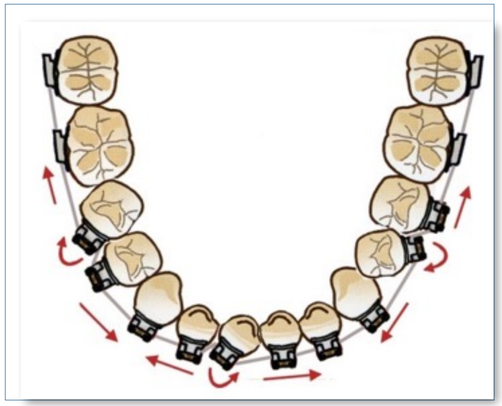


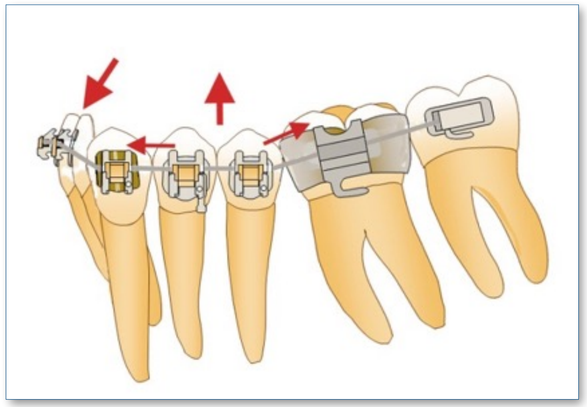
Greatly Enhanced
Sliding

Enhanced sliding with passive self-ligating brackets facilitate all dimensions of continuous arch tooth movement.

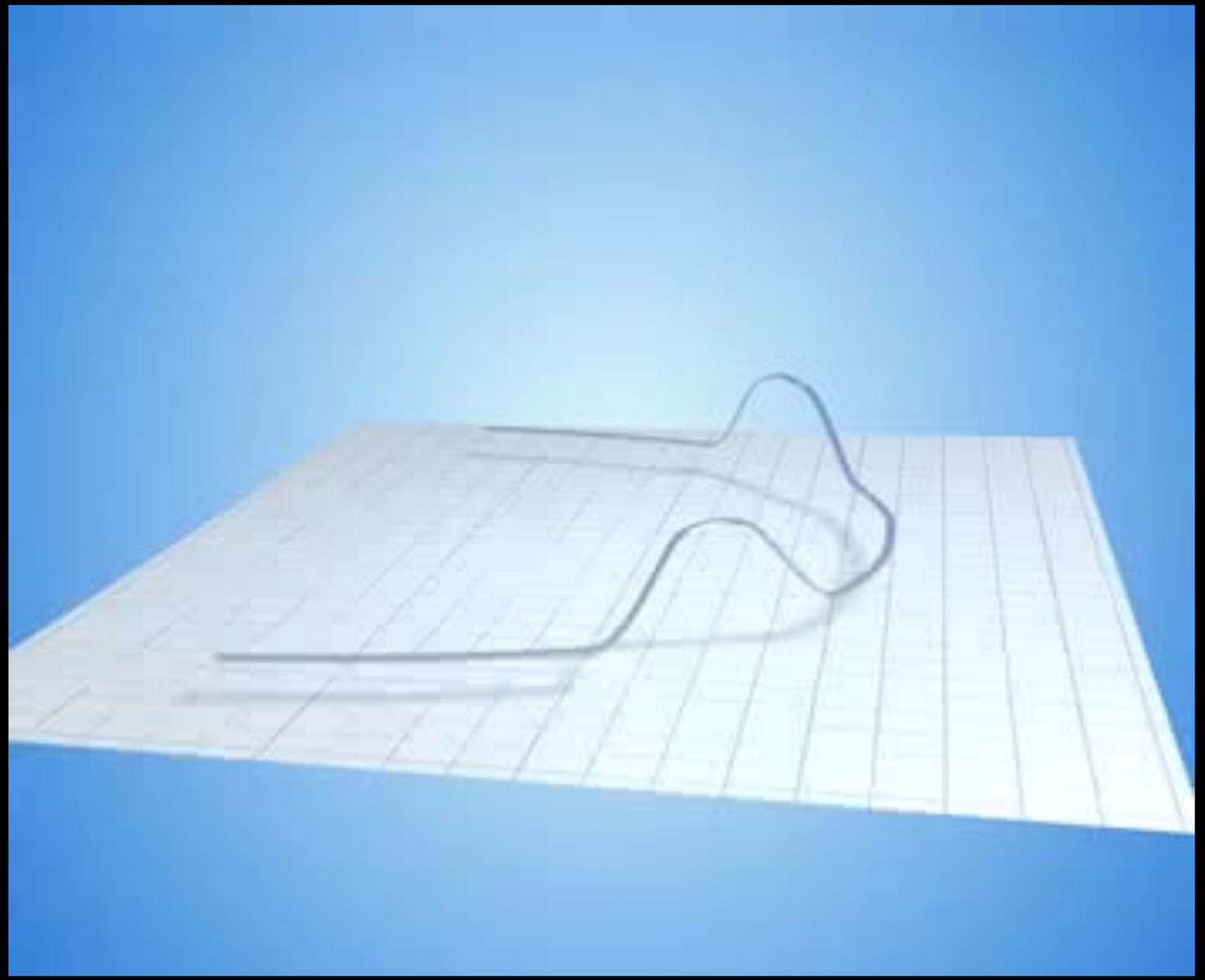








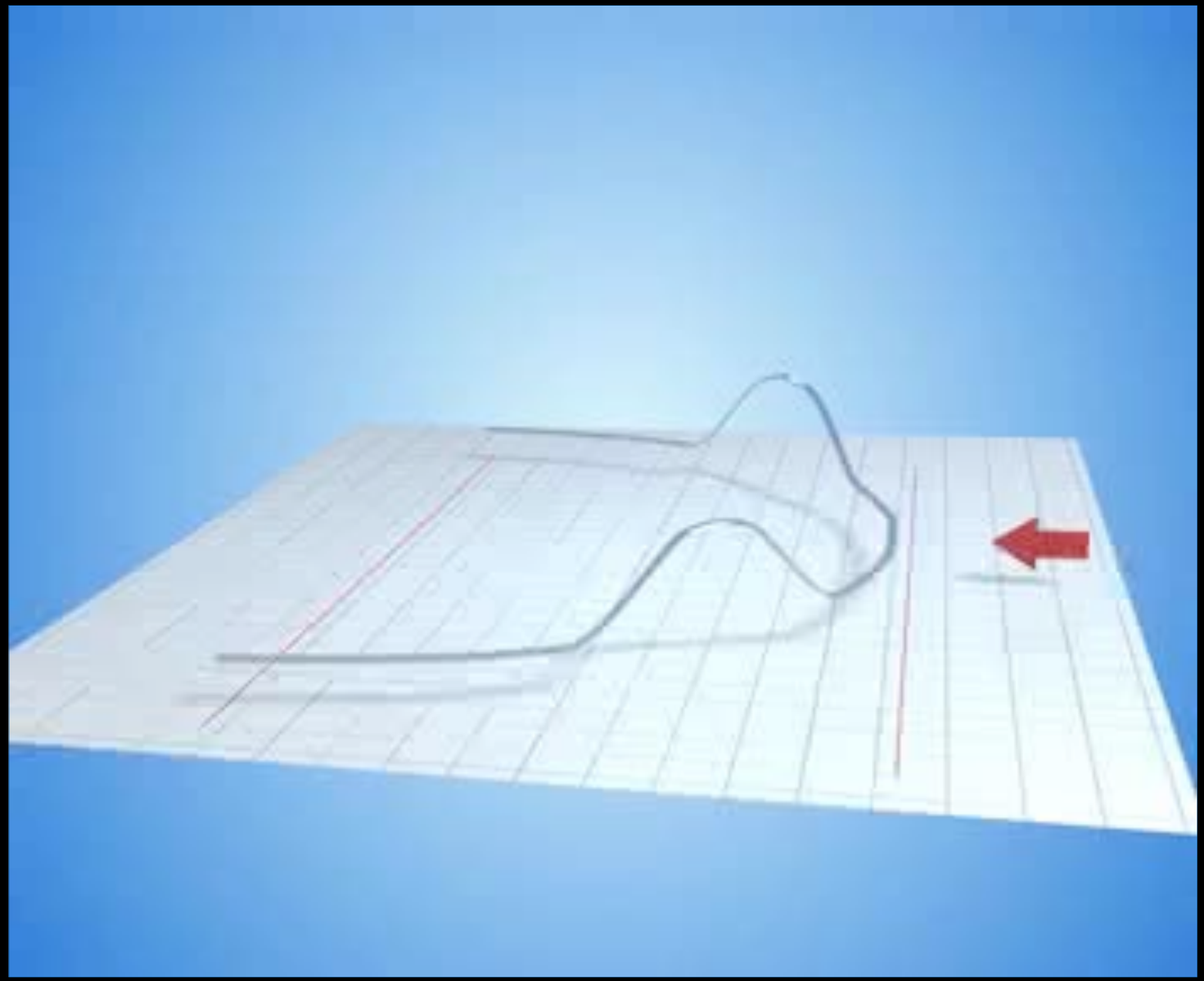
The Effect of Binding



High Friction/Binding Elastomeric Ligation



Low Friction/Low Force Passive Self-ligation

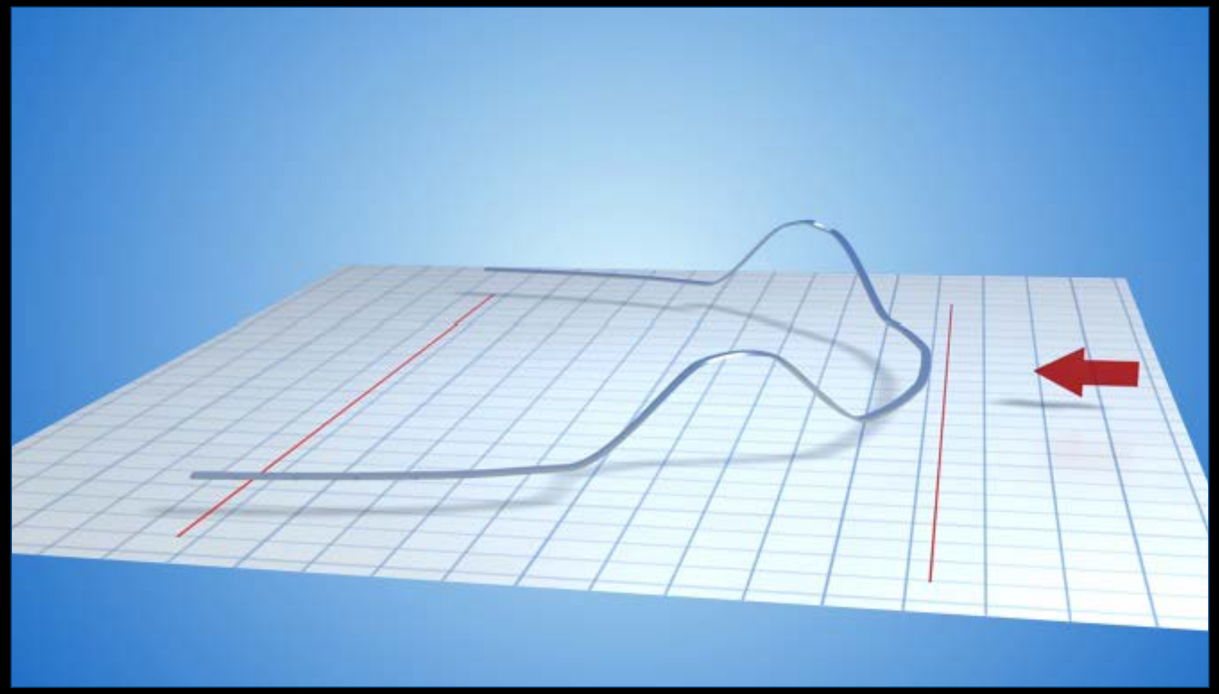


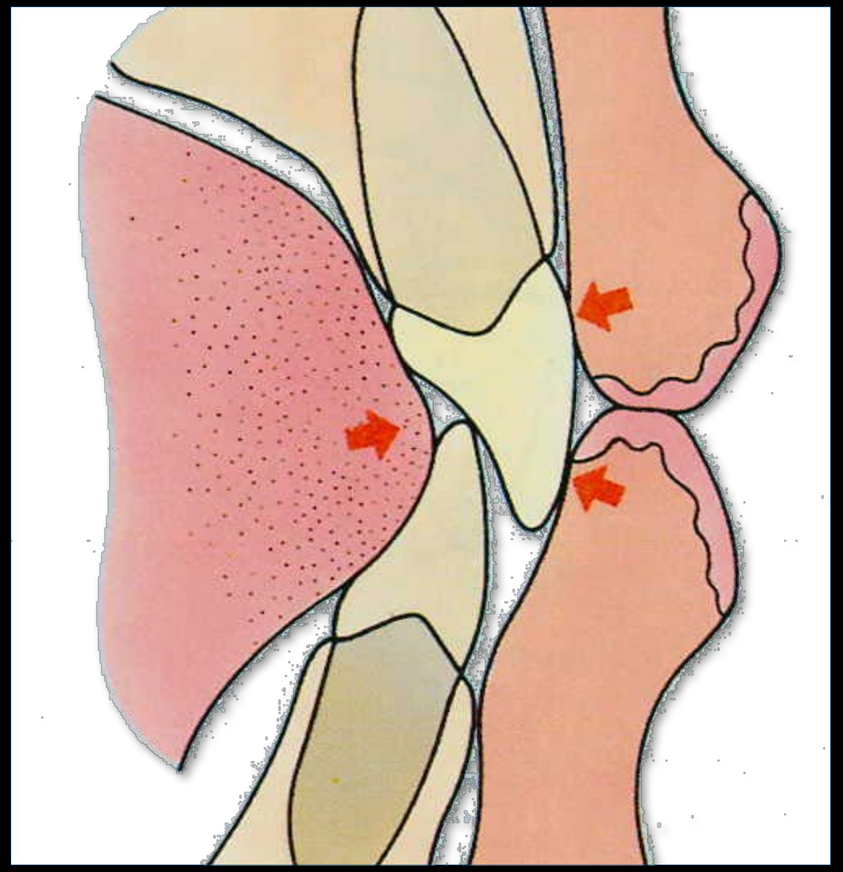
Low Friction/Low Force Passive Self-ligation



Force Management

- The force expressed by the lips will maintain incisor position **if not overpowered.**





Q: Why are we questioning traditional bracket and archwire mechanics?

Archwire choices have been made on patient tolerance rather than its force impact on cellular biology of tooth movement, bone, muscle, and tissue.

CLINICAL IMPACT OF LOW FORCES

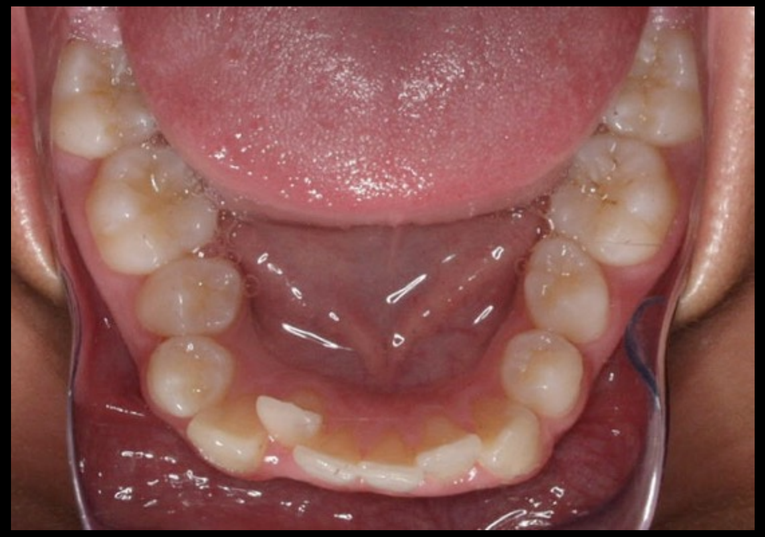




H.H.
12 Years-11 Months
Initial



H.H.
12 Years-11 Months
Initial







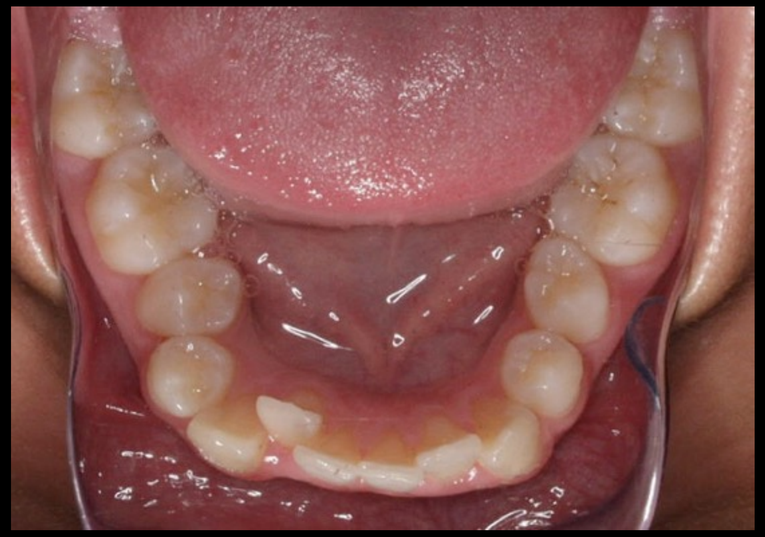


Second Opinion

“Your daughter needs to have extractions, or her gums will be permanently damage for the rest of her life.”



H.H.
12 Years-11 Months
Initial

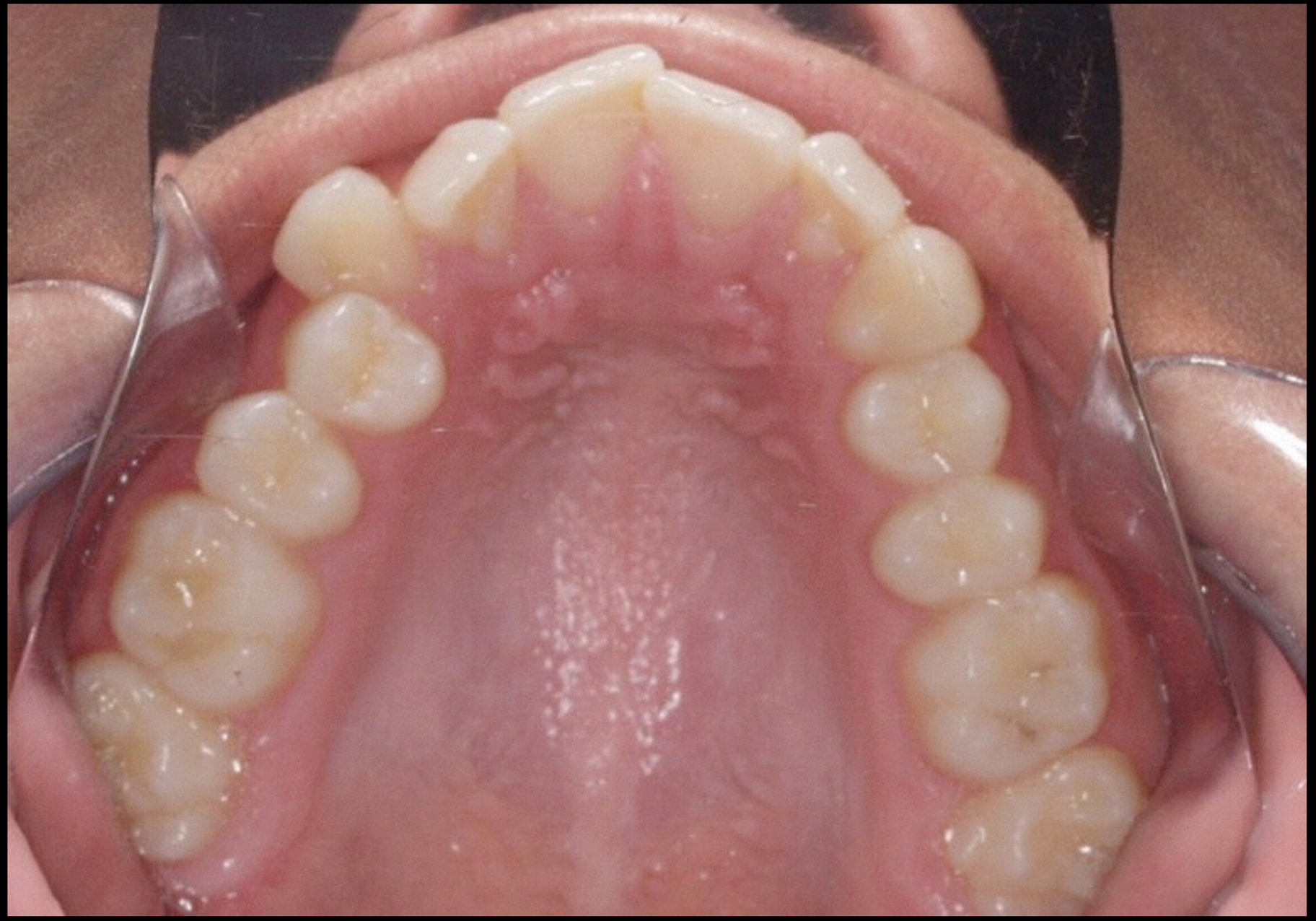









NAME
DATE
TYPE









H.H.
Progress
2 Months
U&L .013 CuNiTi’s





H.H.
Progress
2 Months
U&L .013 CuNiTi’s





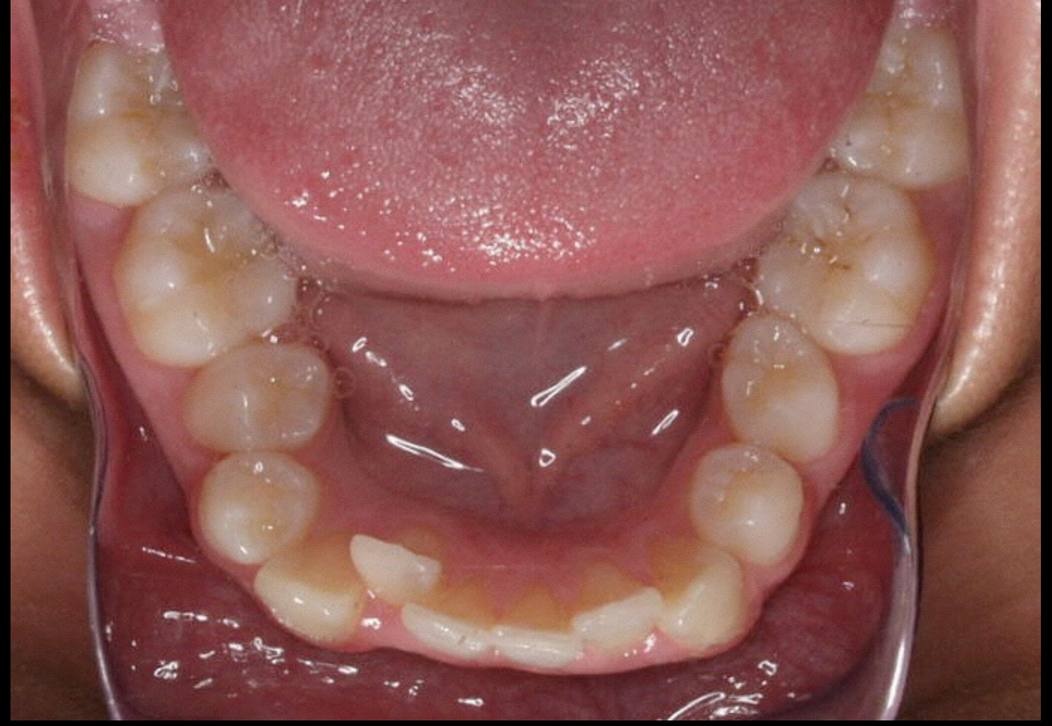
H.H.
Progress
2 Months
U&L .013 CuNiTi’s





H.H.
Progress
2 Months
U&L .013 CuNiTi’s





H.H.
Progress
2 Months
U&L .013 CuNiTi’s









H.H.
15 Months
10 Appts.
Final



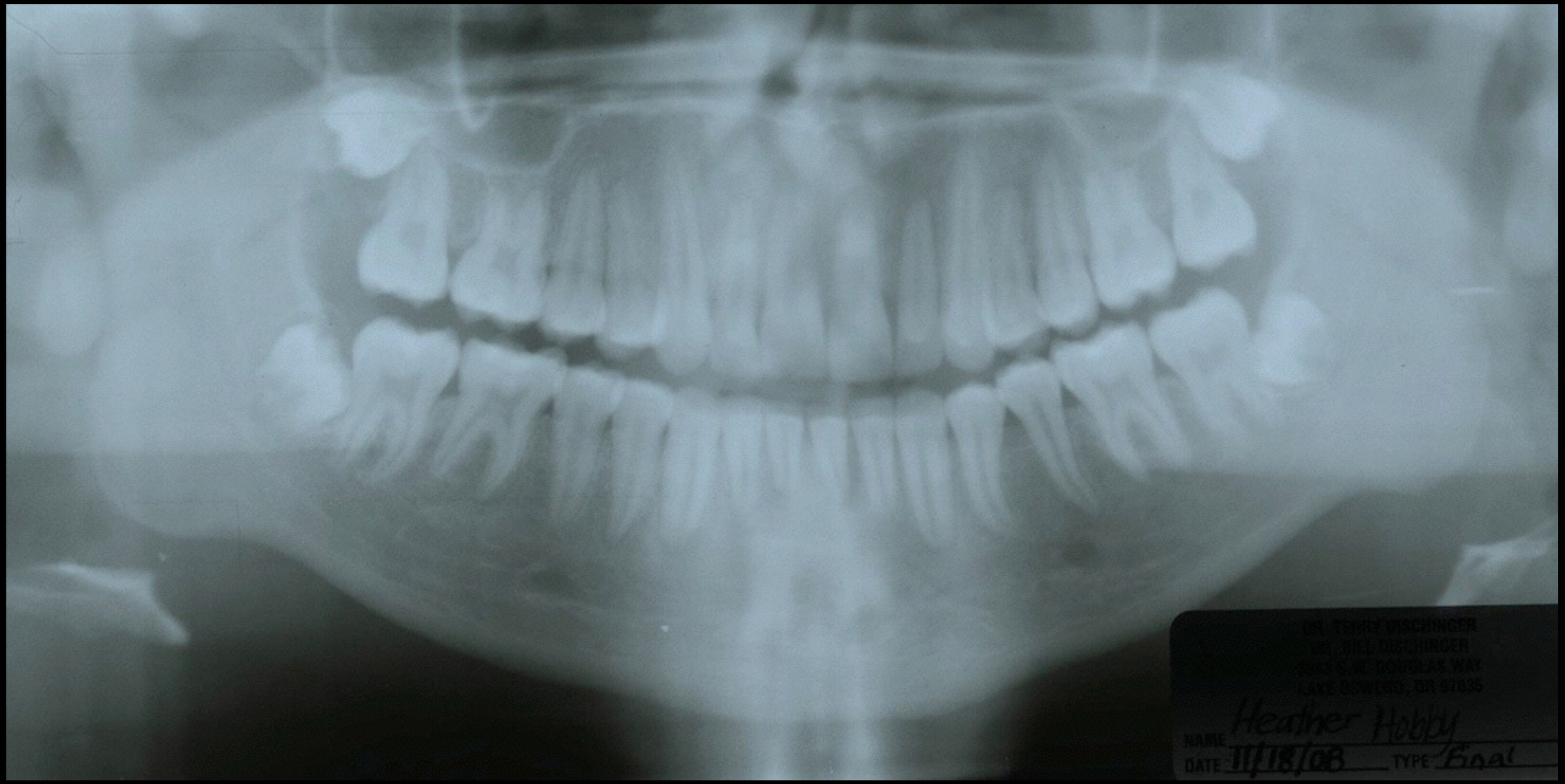
H.H.
15 Months
10 Appts.
Final










NAME Heather Hobby
DATE 11/18/08 TYPE Post



H.H.
15 Months
10 Appts.
Final





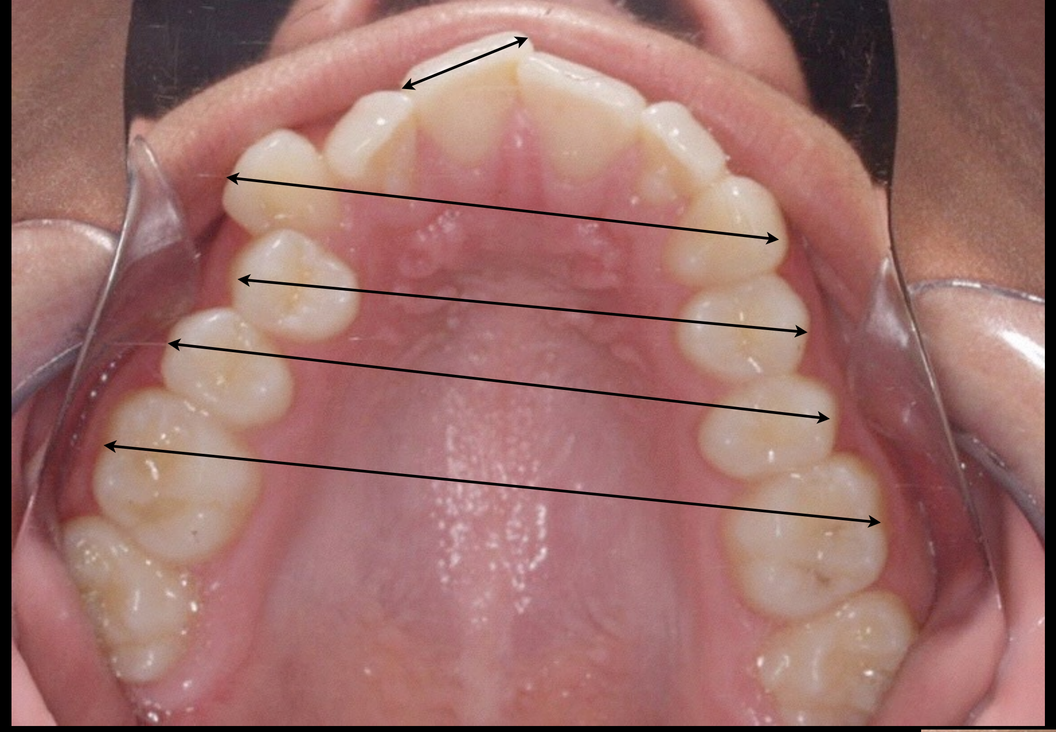
H.H.
15 Months
10 Appts.
Final

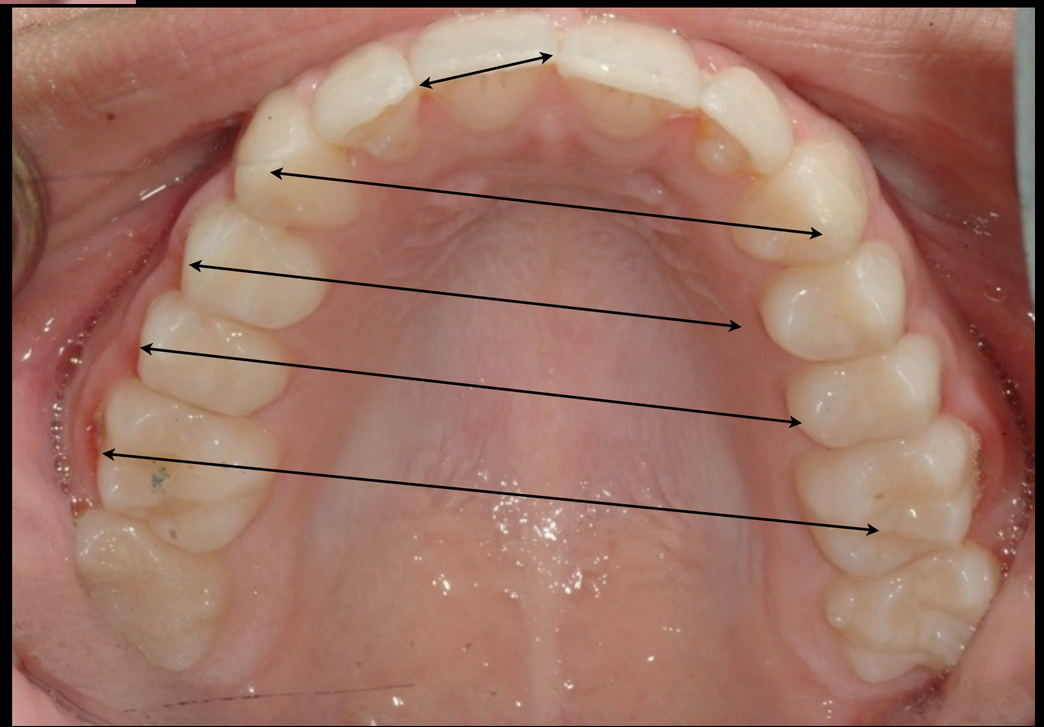




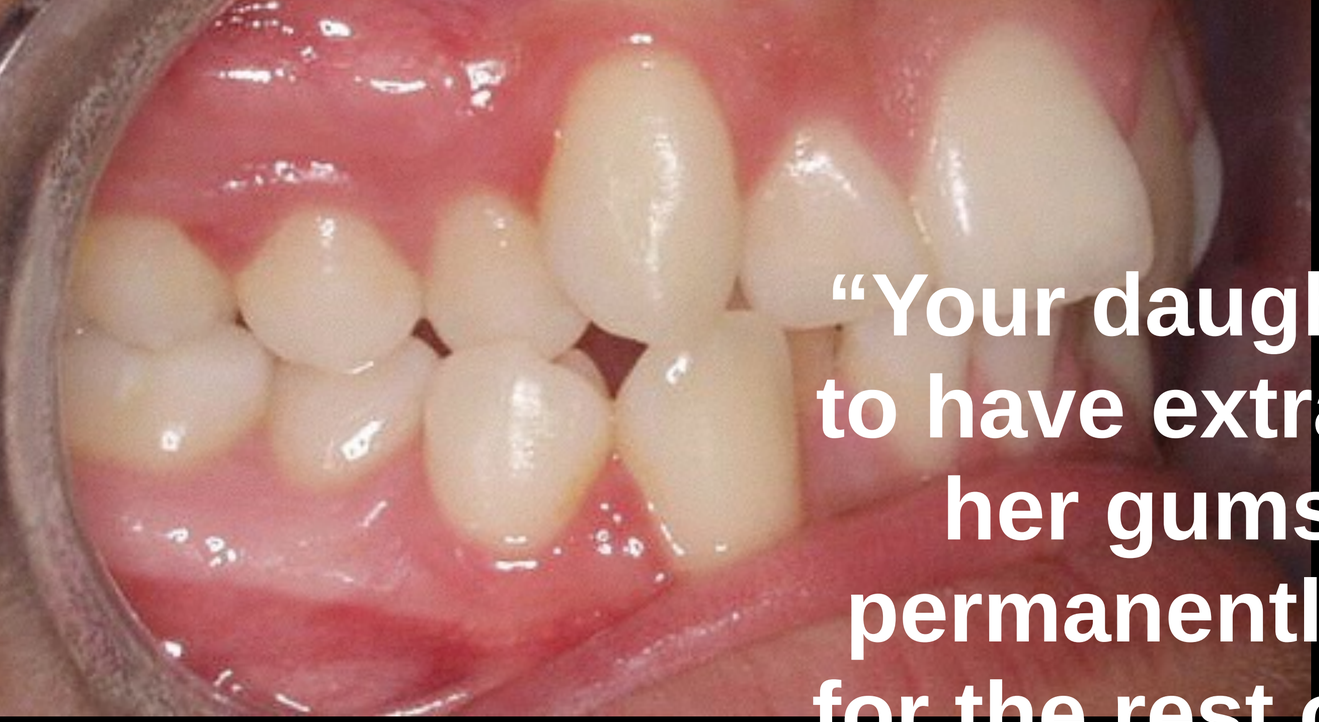
H.H.
15 Months
10 Appts.
Final







H.H.
15 Months
10 Appts.
Final

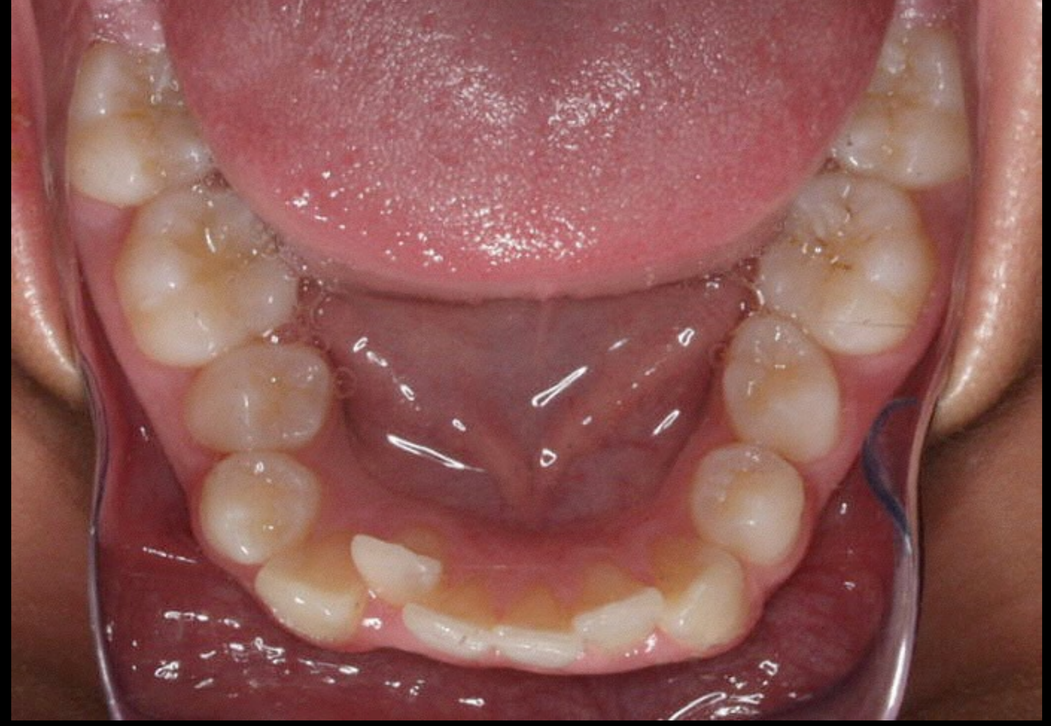


“Your daughter needs to have extractions, or her gums will be permanently damage for the rest of her life.”

H.H.
15 Months
10 Appts.
Final

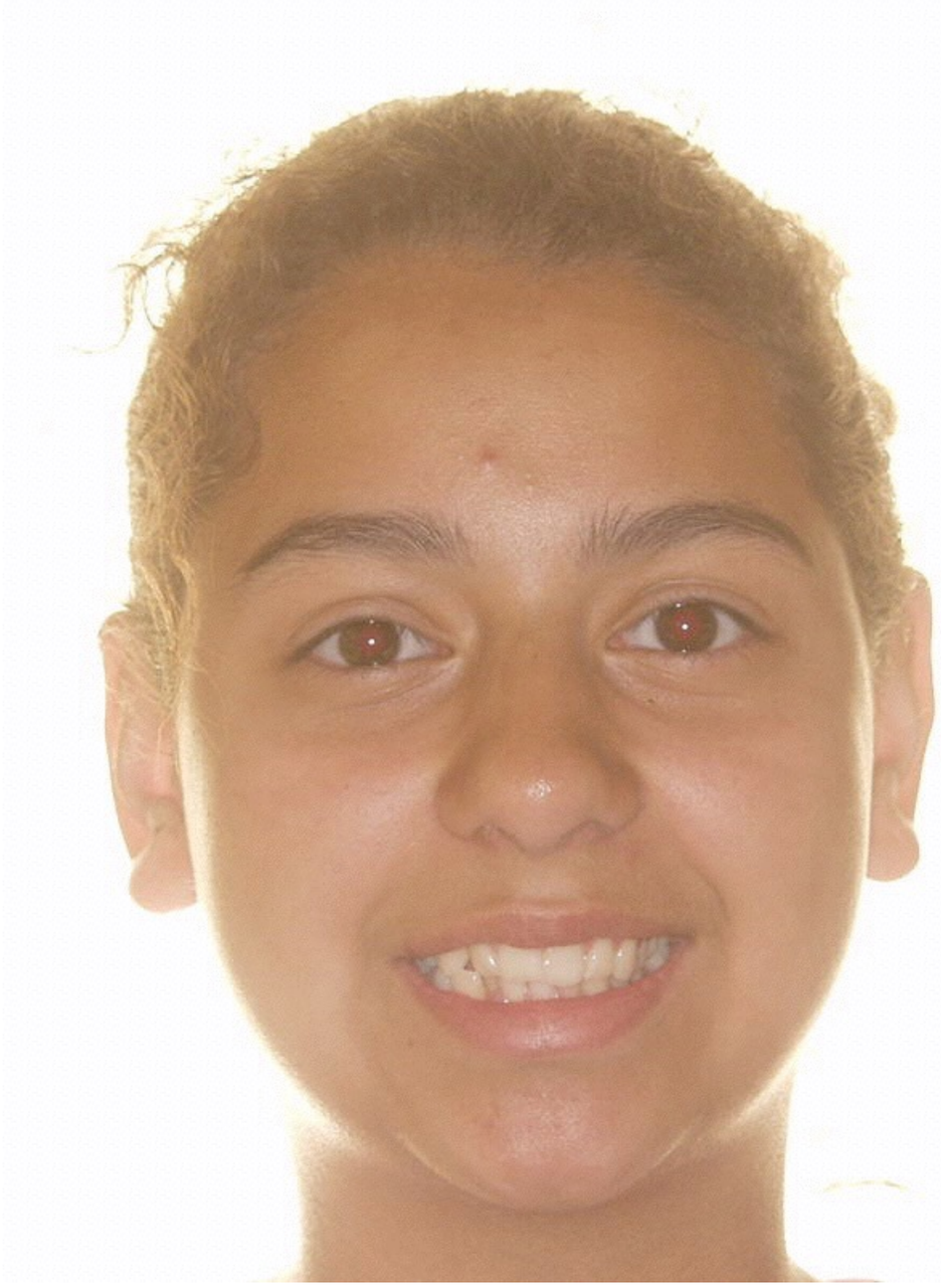






H.H.
15 Months
10 Appts.
Final





Initial



Final

1999

SureSmile Customized Wires

2004

Insignia Custom Brackets



What is Insignia?

Insignia is a sophisticated digital treatment planning and custom-fabricated appliance system – brackets, wires and positioning jigs.

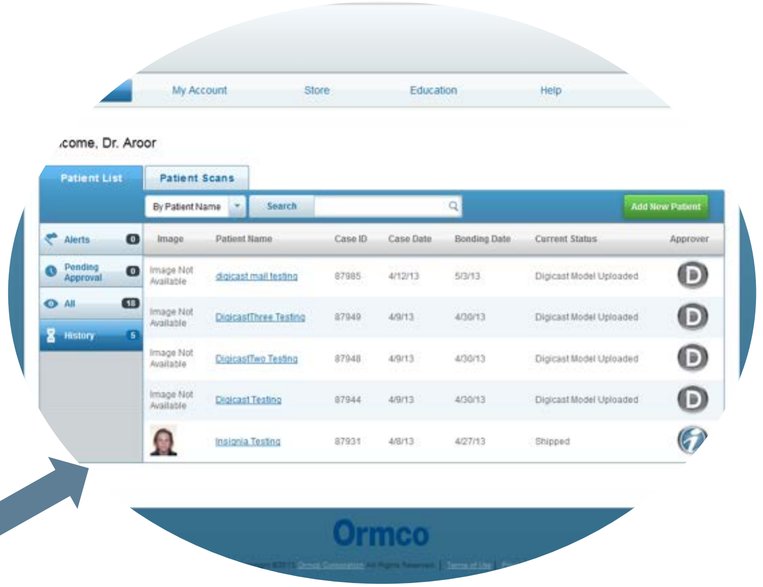
In combination with the Insignia Advanced Smile Design software and the Approver Interface – for determining the ideal finish- the software takes into account the highly variable dental anatomy unique to each patient to deliver a straight-wire approach essential for efficient sliding mechanics.



- Case Submission
  - PVS or Digital Impression
  - Treatment Preferences
  - Upload Patient Photos and x-rays



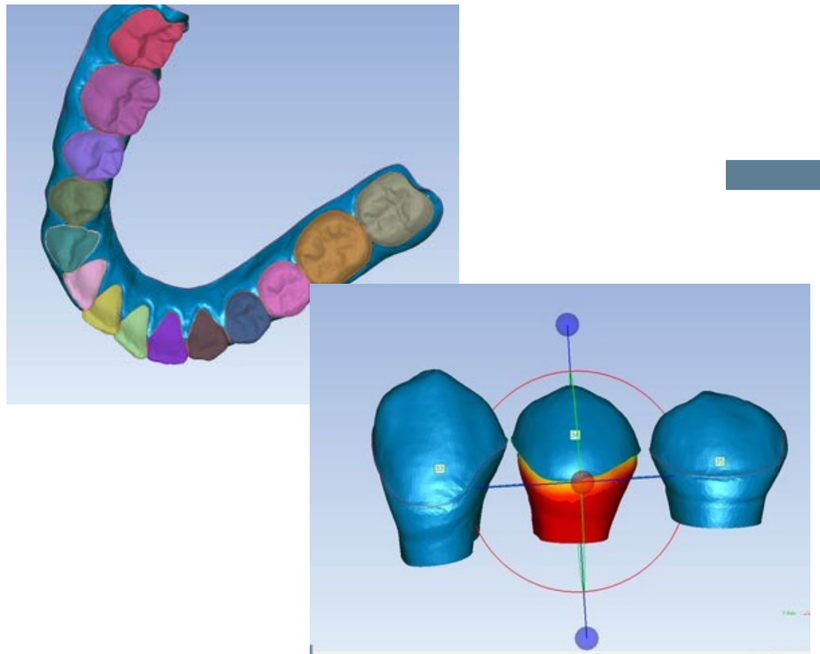






- Impressions processed through design software
- Once teeth are aligned, custom appliances are calculated and designed according to the proposed setup (T2)







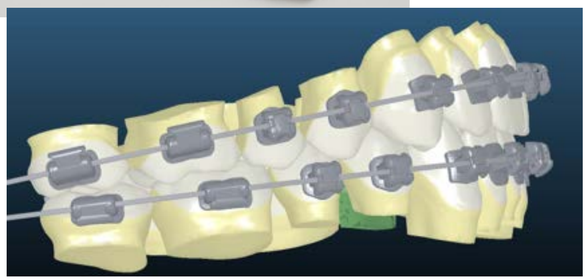


- Manufacture patient-specific custom brackets and wires



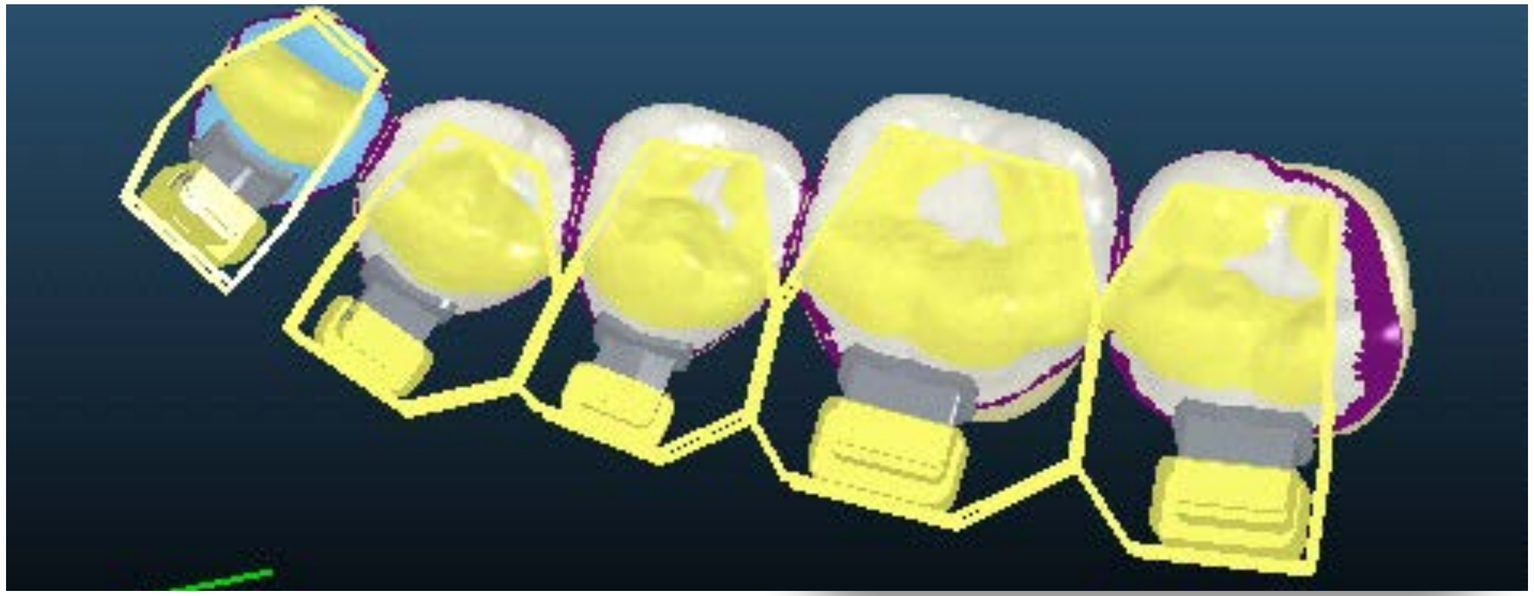








- Precision placement guides built to fit onto each patient’s unique occlusal anatomy



2006

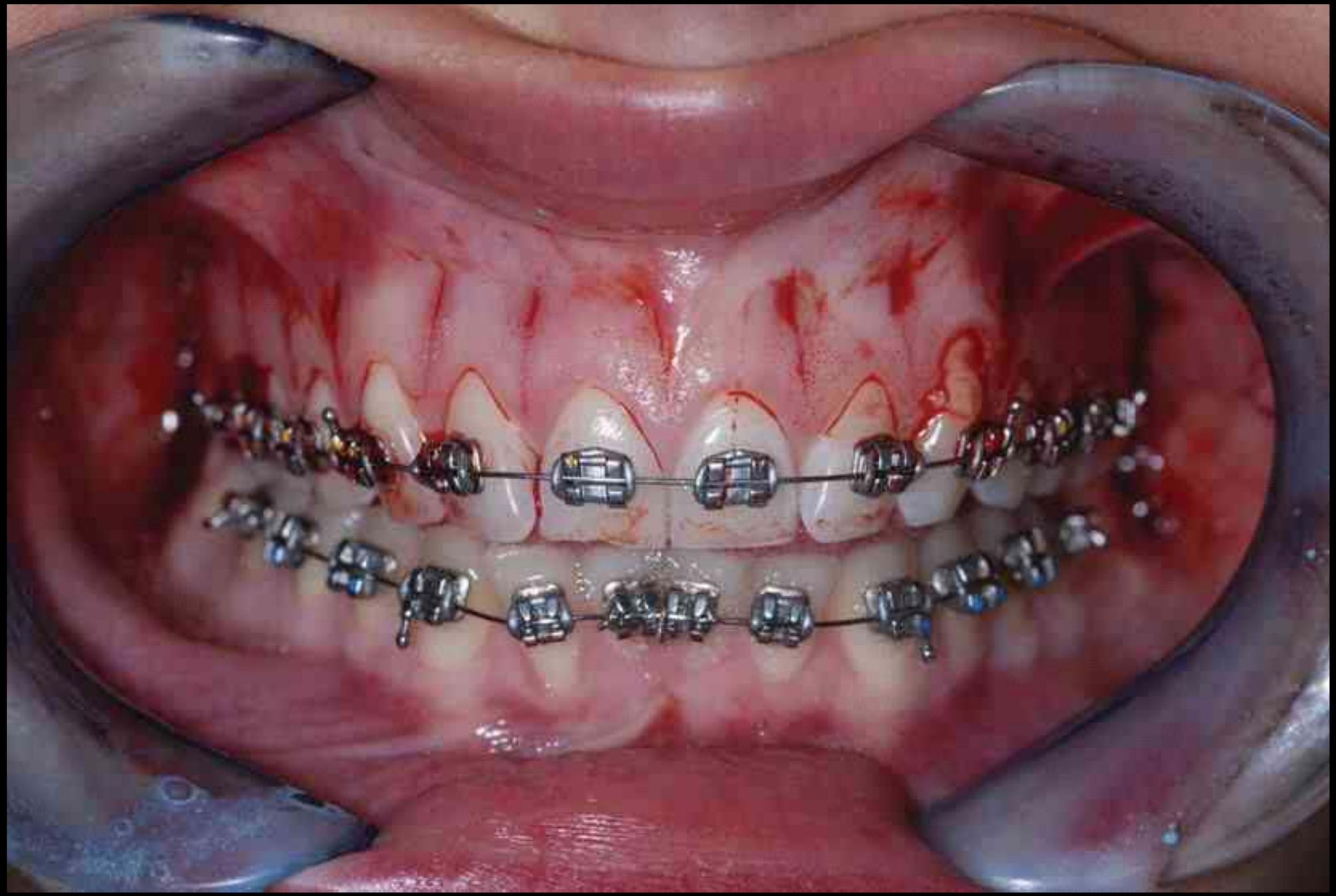
Piezocision Orthodontics

Minimally Invasive

Corticotomy















Minimally Invasive
??

2009

Micro-osteo-perforation

The Science Behind Micro-Osteoperforation

Micro-Osteoperforation

Bone injury (inflammation):

- cytokines production ↑
- rate of bone remodeling ↑
- bone density ↓

Frost et al., 1988

Shih et al., 1985

How does Micro-Osteoperforation work?

- In orthodontics we know that the rate that bone remodels determines the speed of tooth movement and a patient's treatment time
  Deguchi et al., 2008; Krishnan and Davidovitch, 2005

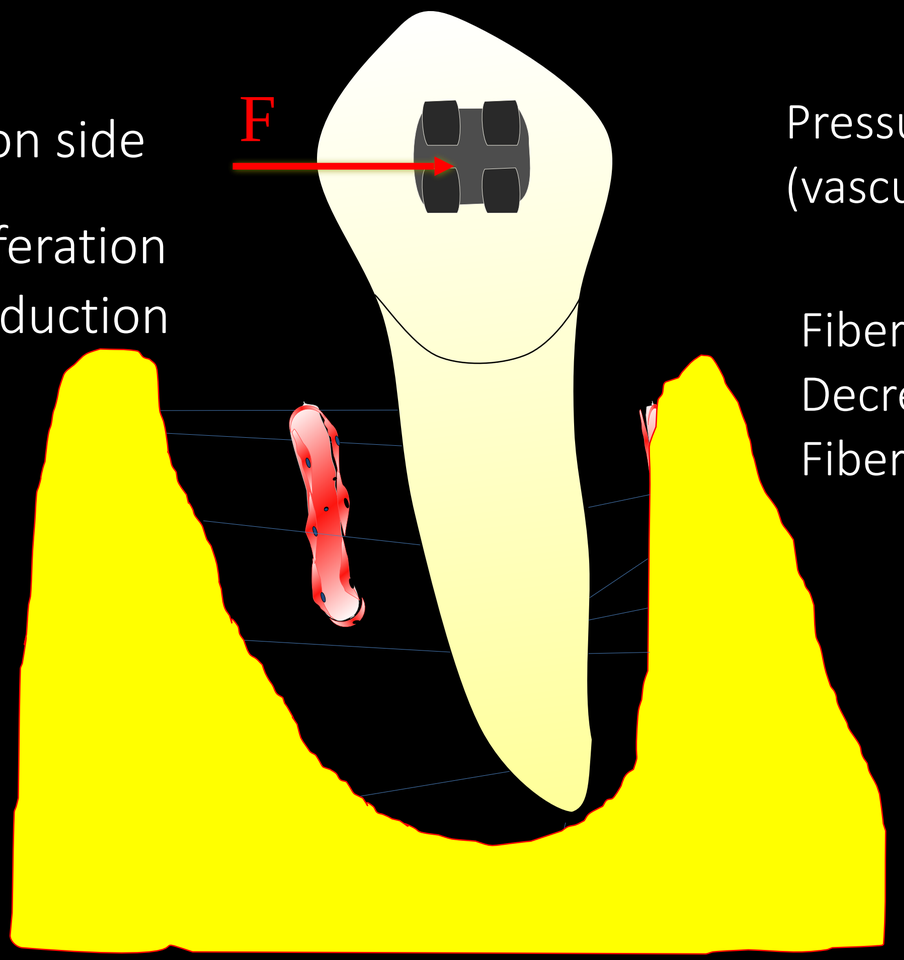
- Decades of research refined into a simple and easy in-office procedure using micro-osteoperforations. Moving teeth faster is now easier than ever and is clinically proven safe.[1]

- Dense bone will be temporarily "softened" internally. This will be undetectable to the patient, but allow these movements to occur faster & easier. When incorporating micro-osteoperforations into a patient's orthodontic treatment, tooth movement can be increased 2.3 fold.[1]

[1] Alikhani M, Raptis M, Zoldan B, Sangsuwon C, Lee YB, Alyami B, Corpodian C, Barrera LM, Alansari S, Khoo E, Teixeira C. Effect of micro-osteoperforations on the rate of tooth movement. Am J Orthod Dentofacial Orthop. 2013;144(5):639-648.

Tension side

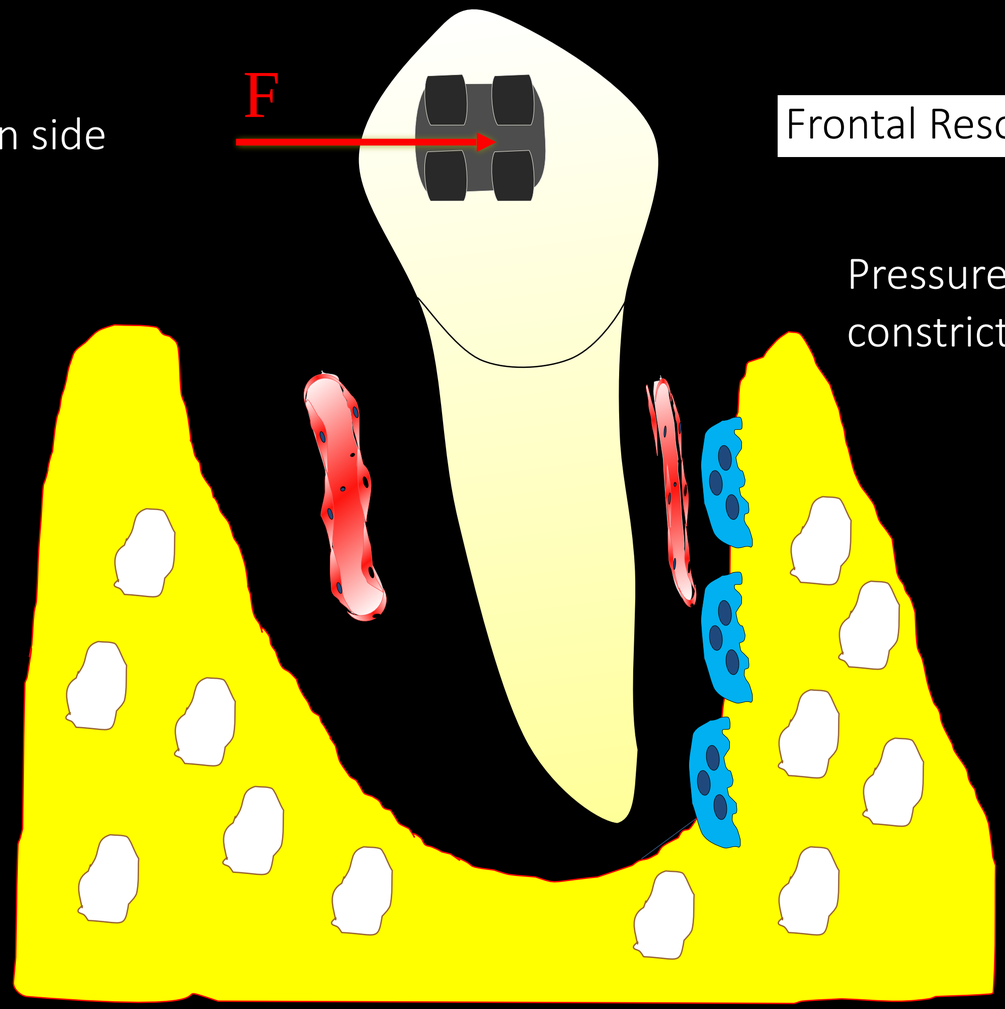
Cell proliferation
Fiber production



Pressure side
(vascular constriction)

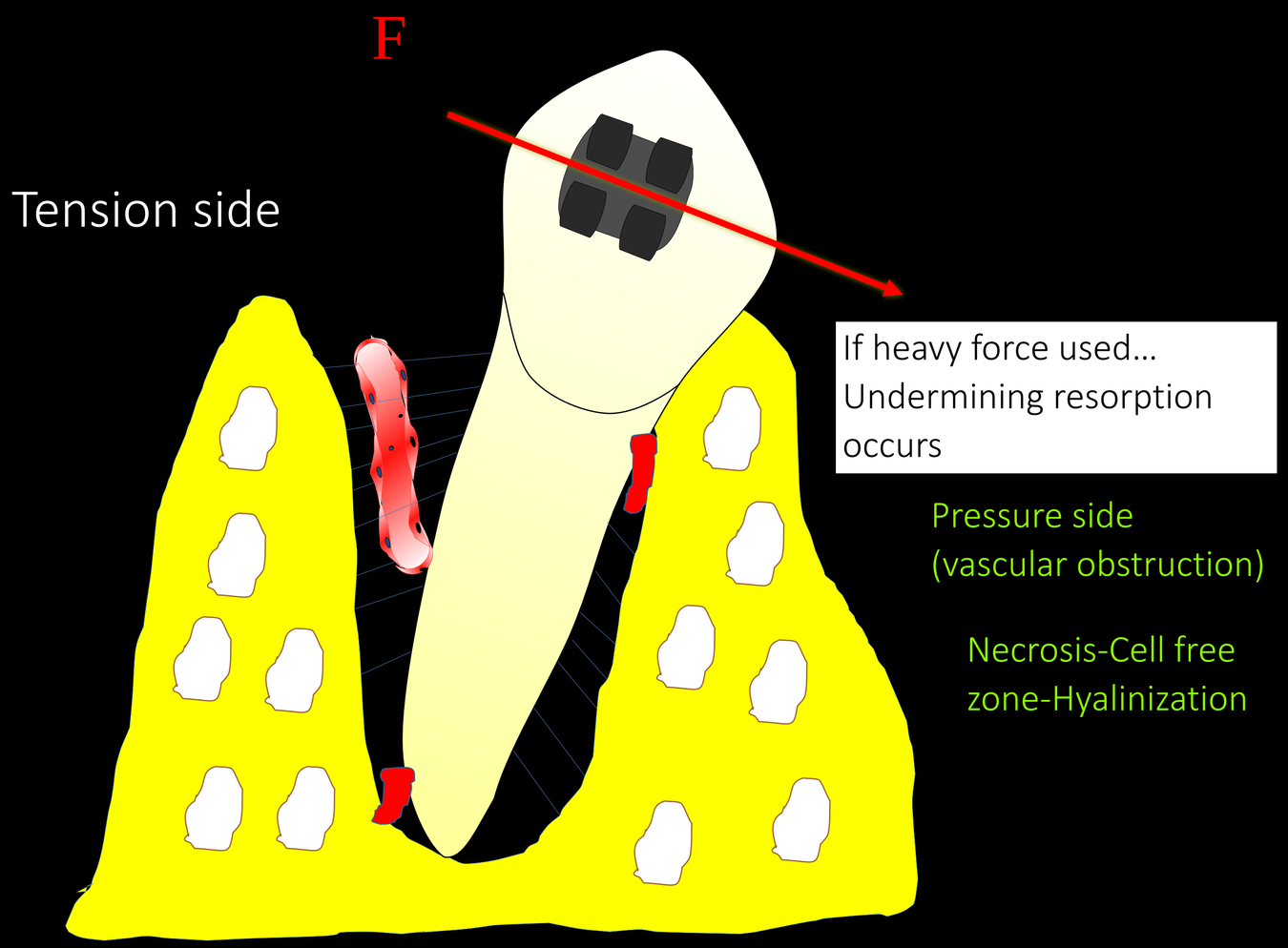
Fiber disorganization
Decrease cell proliferation
Fiber production

Tension side

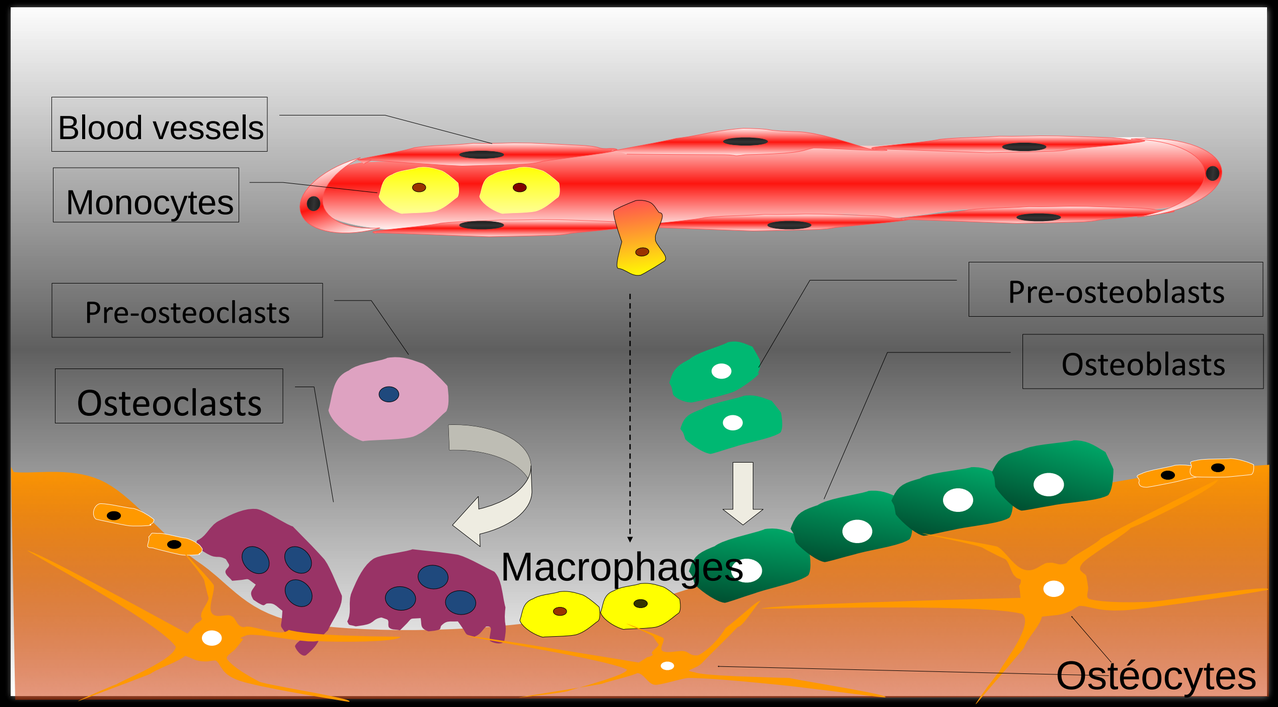


Frontal Resorption

Pressure side (vascular constriction)


F
Tension side
If heavy force used…
Undermining resorption occurs
Pressure side
(vascular obstruction)
Necrosis-Cell free zone-Hyalinization

Bone Remodeling



Resorption → Formation → Mineralization

New York University Clinical Study

AJO-DO
American Journal of Orthodontics & Dentofacial Orthopedics

NYU Clinical Study- Key Points

- The study utilized the Micro-osteoperforation device to create the Micro-Osteoperforations
- Micro-Osteoperforation reduces treatment time by 62%
- Clinical trial demonstrates a 2.3 fold increase in velocity of tooth movement, specifically in canine retraction when using Micro-osteoperforation
- Bodily movement was shown, no tipping
- Patients reported little to no post-treatment discomfort

CTOR.
consortium for translational orthodontic research

NYU | DENTISTRY

PUBLICATION
American Journal of Orthodontics & Dentofacial Orthopedics (AJO-DO)

TITLE
“Effect of micro-osteoperforation on the rate of tooth movement”

AUTHORS
New York University College of Dentistry- Department of Orthodontics Mani Alikhani, Cristina Teixeira, et al.

NYU Clinical Study



A: At time of treatment. Left side treated with Micro-Osteoperforation, right side is control.
B: 24 hours post-treatment. Note: soft tissue is completely healed.
C: Day 28 Left side has significantly more canine retraction than right side.
D: Day 28- Occlusal View.



Micro-Osteoperforation Devices



Single Use

Micro-Osteoperforation drivers create micro-osteoperforations to stimulate a natural cellular response, harnessing a patient's own biology to accelerate tooth movement

- Depth limiter with LED indicator
- Patented pitch on leading edge
- Proprietary surgical steel construction
- Conveniently packaged for single use
- Ergonomic design for enhanced tactile sensation and control
- Higher helix thread pitch
- Soft retractable sleeve mechanism to hold tissue taut

Micro-Osteoperforation Devices



Reusable Handles

Micro-Osteoperforation drivers create micro-osteoperforations to stimulate a natural cellular response, harnessing a patient's own biology to accelerate tooth movement

- 2 disposable tip options provide enhanced clinical accessibility
- Large handle with textured grip for increased stability and control
- Proprietary tip construction ensures consistent integrity for maximum number of Micro-Osteoperforations
- Sterilizable handle reduces material waste
- Unique flute angle minimizes soft tissue impact

Benefits of Micro-Osteoperforation

Patient Benefits

- Minimally invasive
- Technique performed chair-side in minutes by treating clinician
- Can be used with aligners or braces
- Releases difficult movements
- Accelerates treatment
- Increases treatment predictability
- No patient recovery time needed
- Doctor-controlled, not reliant on patient compliance
- Saves time, less office visits means less time off work or school

Benefits of Micro-Osteoperforation

Practice Benefits

- Provides cutting edge technology
- Increased treatment acceptance: patients are more likely to accept a faster treatment time.
- Attracts new patients: patients today are looking for faster treatment times and practices are embracing the latest technology.
- Incorporate a premium treatment option
- Reduced patient burn out

Micro-Osteoperforaiton Used for Acceleration

3 Easy Steps in Minutes

1. Evaluate Treatment area

- Palpate tissue
- Evaluate x-ray



iCAT FLEX



3D Treatment Plans

3 Easy Steps in Minutes

2. Chlorhexidine rinse

- Two times for one minute each



3 Easy Steps in Minutes

3. Anesthetize & Accelerate

- Treatment area can be anesthetized using either a topical or local infiltrative anesthetic.
- Micro-osteoperforation depths are determined by soft tissue thickness and penetrating the bone at 2mm.



Lidocaine 10%
Prilocaine 10%
Tetracaine 4%
Phenylephrine 2%





Treatment Considerations

- Most patients require 1 – 2 treatments
- Complex cases may require 3 treatments
- 2-3 Micro-osteoperforations are recommended mesial and distal
- Osteoclastic response is 6 – 10 mm around treatment site
- For acceleration, perforate around rate limiting movements
- Depth selection: typically Anterior 3mm, Posterior 5-7mm and Palate 7mm
- Osteoclastic effect peaks in 24 hours and remains elevated for 10-12 weeks
- Treatment may be repeated at 10-12 weeks or as deemed necessary

The Technique

1. Set depth (3, 5 or 7mm)
2. Rotate clockwise while applying gentle pressure
3. Check engagement with light tug back
4. LED Depth Stop indicator will illuminate when desired depth is reached
5. Rotate counter-clockwise to remove





Where to Perforate

Micro-osteoperforation can be performed either buccally or lingually. Buccal access is most often the simplest approach, depending on desired movement and patient's oral anatomy.





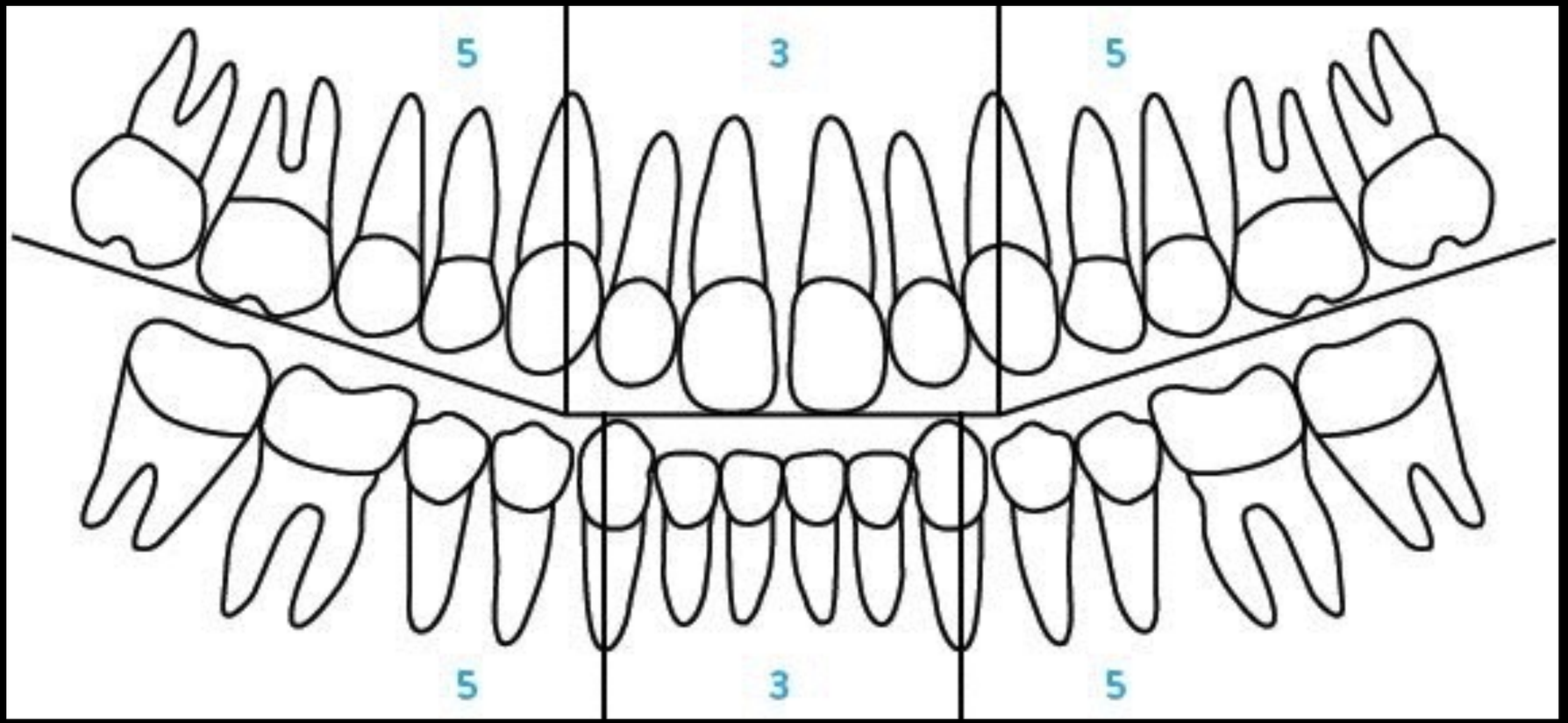


How Deep to Perforate

Perforation device has three depth settings: 3 mm, 5 mm and 7 mm. The correct depth should be selected based on the thickness of the gingiva and alveolar bone in the treatment area.

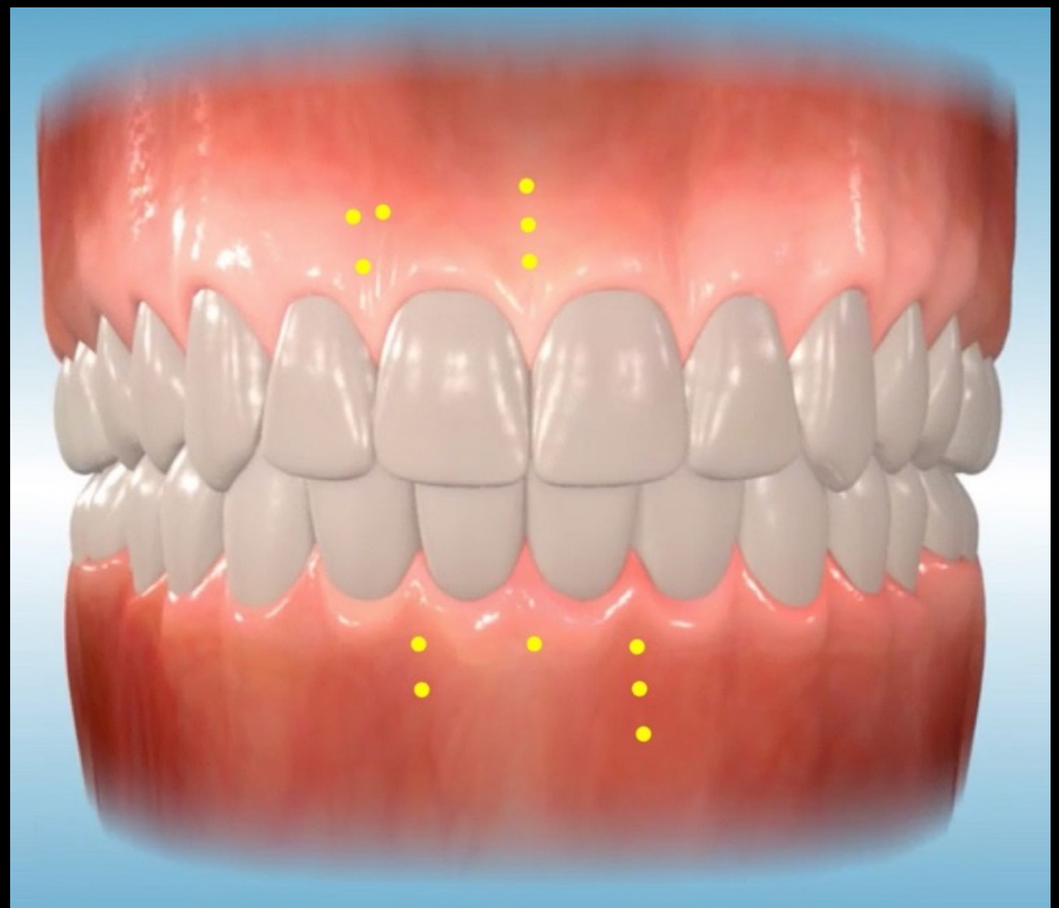
Typically 3 mm is all that is needed on both the maxilla and lower canine to canine, some patients may need 5-7 mm around mandibular molars and palate.

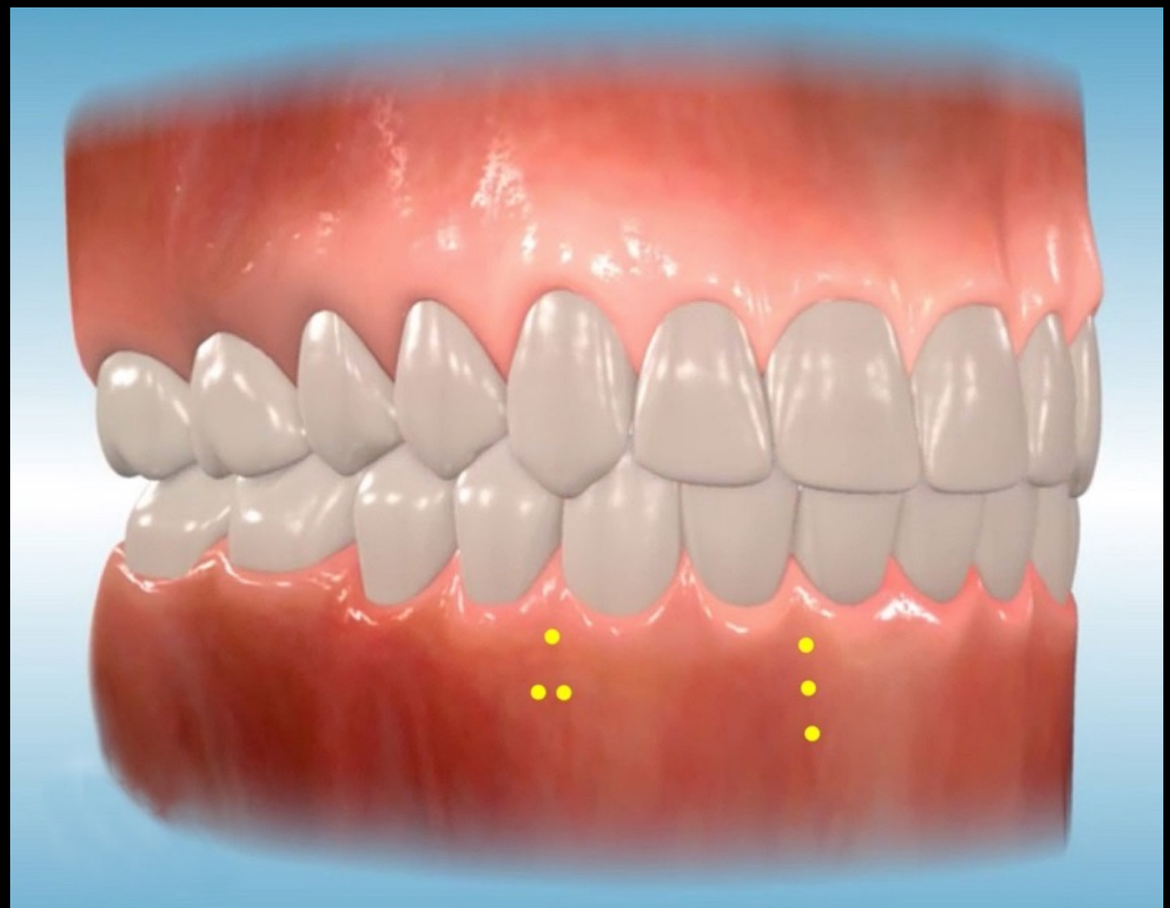
Recommended depth



How Many Micro-Osteoperforations?

Where possible perform 2-3 micro-osteoperforations depending on proximity of anatomical structures. Perforations can be made buccal or lingual in linear or triangular patterns.





Micro-osteoperforation with Aligners

Proactive Acceleration (Enables 7 -9 day intervals)

- Perforate the appropriate area and provide patient with aligners (see chart below). Schedule follow up visits accordingly.
- Instruct patient to call office if aligners do not fit the same as initial visit
- Record dates on aligner bags and instruct patient when to change out aligners

Reactive Acceleration

- Return patient to best fitting aligner. Perforate mesial/distal to non-tracking teeth. Deliver 3 aligners and schedule follow up visit in 3-4 weeks.

Micro-osteoperforation with Brackets

Proactive Acceleration

- Maintain the same biomechanics with the bracket system currently used
- Shorten treatment time frame between appointments to 70% of my normal intervals.
- Treatment at Level & Align fast tracks movements for more predictable finish
- Perforate mesial and distal to site(s) where mechanics call for greatest movement
- As many cases are delayed by 3-4 difficult movement sites, Micro-osteoperforation is only required in these areas

Post Micro-Osteoperforation





Post-treatment Instructions

- Patient may experience some tenderness around treatment site for 24 – 48 hours, this sensitivity is similar to that of an orthodontic adjustment
- Patient should not take any Non-Steroidal Anti-Inflammatories (NSAIDs), only Tylenol should be recommended if any discomfort occurs
- Perforation may be repeated in 10-12 weeks or as needed
- Post-treatment instructions are similar for local or topical anesthetic



The Technique

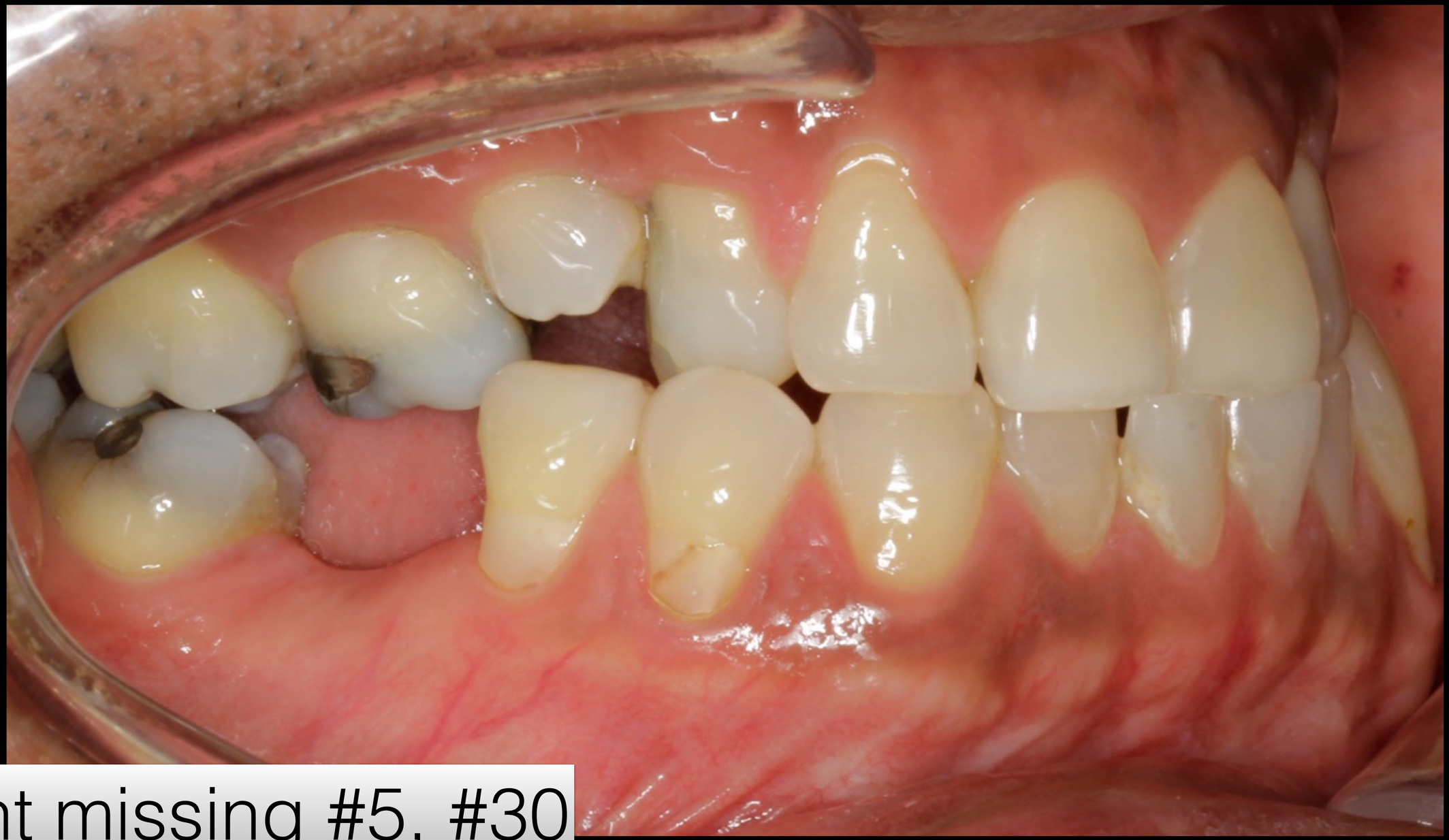
1. Remove tip of choice from sterilized packaging. To insert the tip, depress the Release Button on the driver and slide the keyed end of the tip into bottom of driver then release the button to lock in tip.
2. Hold the RT device at a 90-degree angle to gingiva while keeping tissue taut.
3. Rotate clockwise while applying gentle pressure. Continue to turn until the desired depth is reached. Line marks on sleeve indicate depth at 3mm, 5mm, and 7mm.
4. Rotate counter-clockwise to remove



CLINICAL CASES USING MICRO-OSTEOPERFORATIONS

2 different cases where I have used MOP to help me finish the difficult nature of these cases during treatment with the Damon System

Case I: Opening Implant space for missing tooth



Patient missing #5, #30







Hubie E. Age 44

Missing teeth and prepare for implants


Posterior left cross bite and class III molar



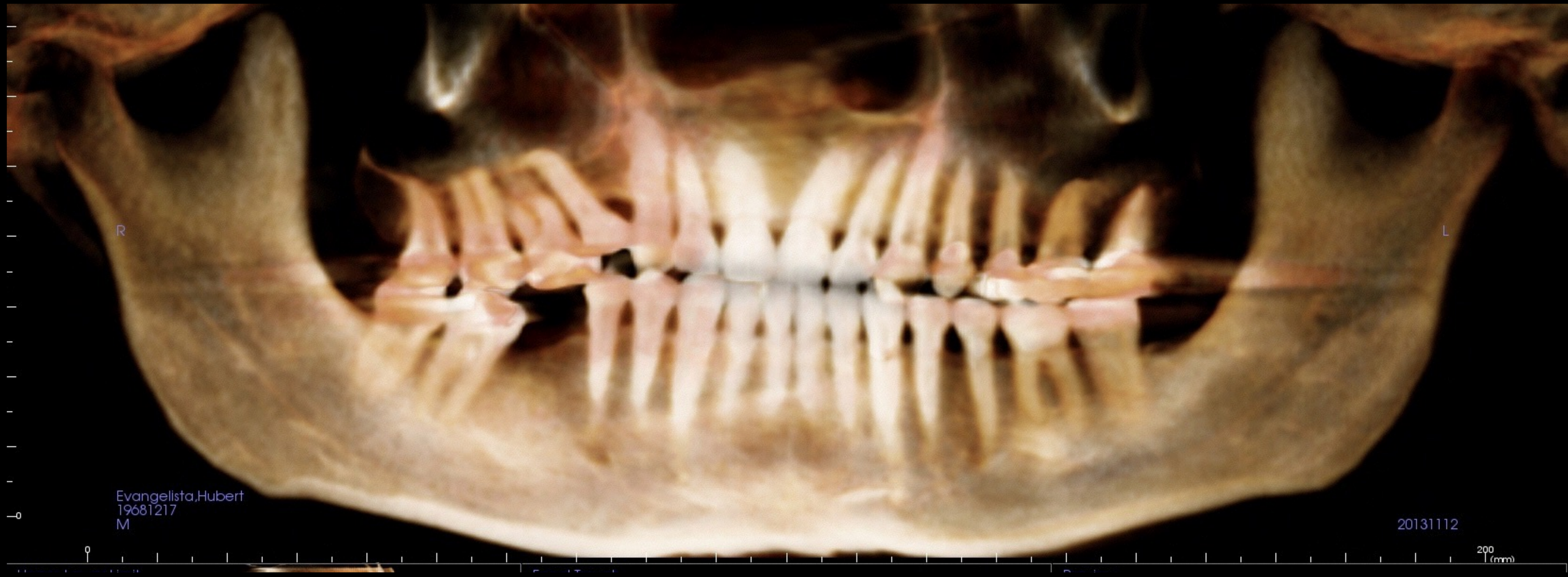
Patient missing UR4, LR6



Posterior left cross bite and class III molar







Patient missing #5, #30

Treatment Plan



- Non-extraction(#1)
- Eliminate crossbite/broaden arches without expander.
- Open space on #5 for implant/USE MOP if necessary
- Prepare implant sites
- Posterior disarticulation off of first molars.
- Class III and cross bite elastics.



Initial



Final



20 Months in Treatment

Case Notes

- We performed MOP at 8 months of treatment
- MOP was performed from the Distal of #6-Distal of #4.
- 3 Perforations were initiated and spaced 3mm apart vertically.
- Within 3 months 3 mm of space had opened and at 6 months, the space was opened fully and the space was ready for implant placement.
- Only one MOP procedure was performed on this case



Initial MOP



3 months after MOP

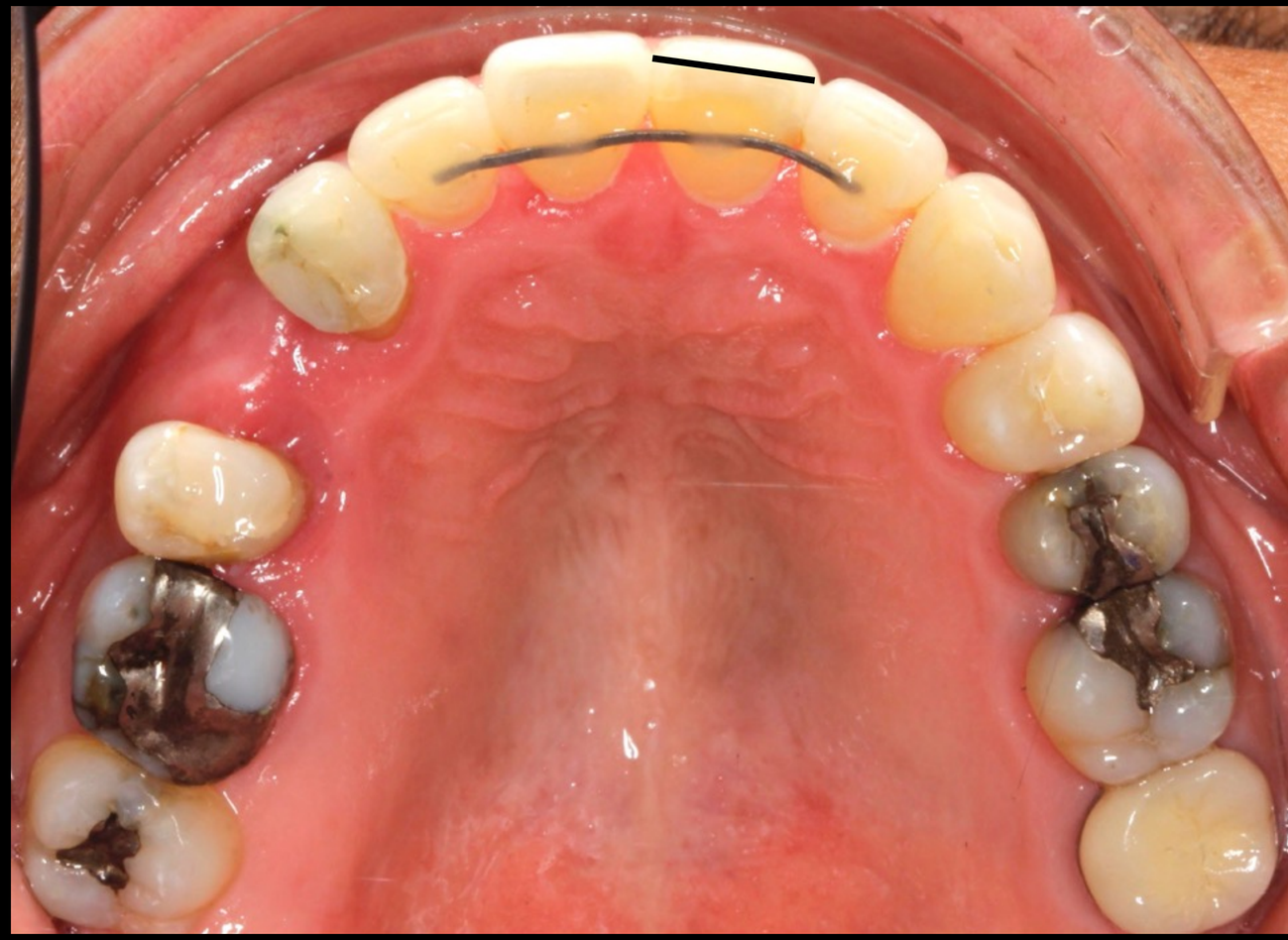


6 months after MOP

Initial



Final



Implant space is accomplished

Case 2: Opening Implant space for previous extracted bicuspids for optional facial aging-then closing the space using TADS









Julie B. Age 40

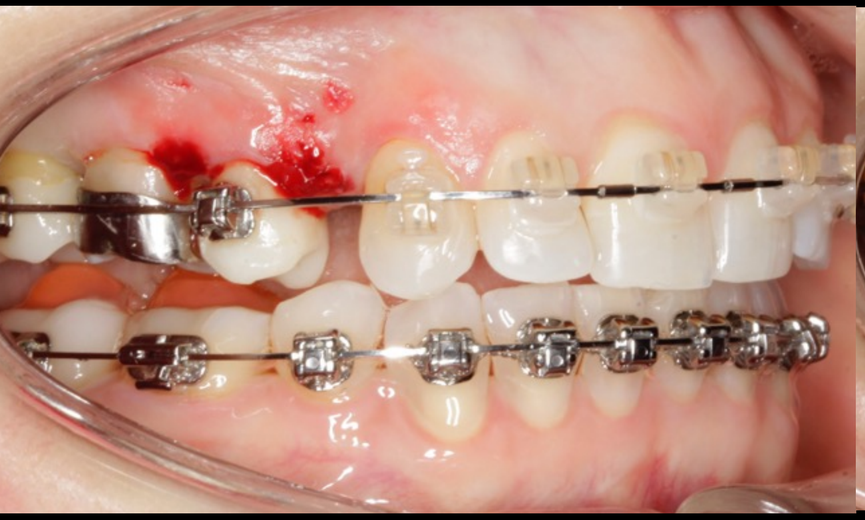
Treatment Plan

- Upper Clear/Lower SS
- Open up space for missing bi’s and use TADS to close molars forward



Case Notes

- Patient had previous 4 bicuspid extraction as a teenager and was not happy with her facial esthetic decline and posterior maxillary and mandibular collapse.
- Proposed space opening for missing bicuspids and use TADS to anchor anteriors and close posterior teeth forward.
- At 14 months of treatment MOP was used to help the right side to close similar to the left side.
- Space took 4 months to close after MOP Procedure.



Initial MOP

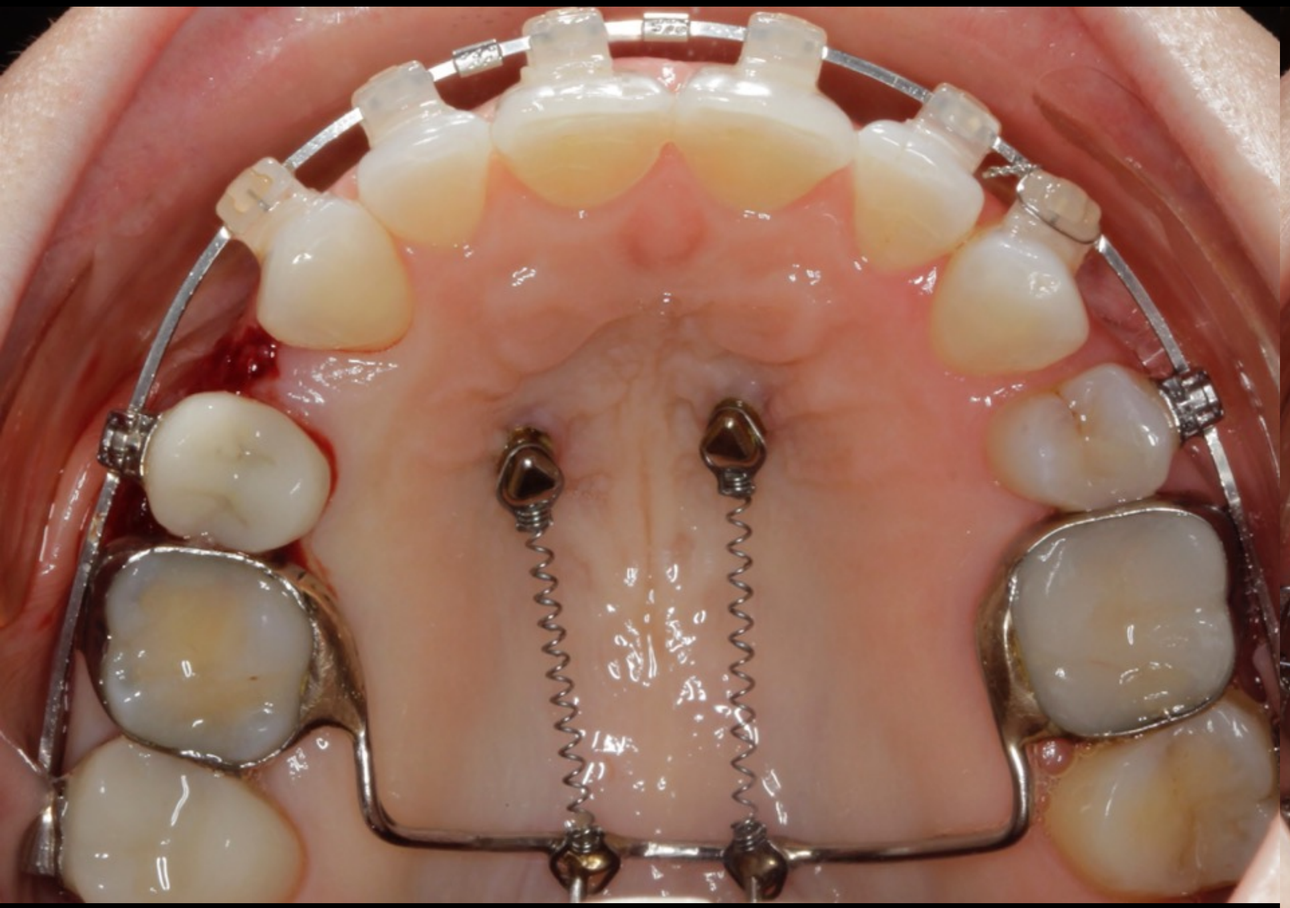


4 months after MOP

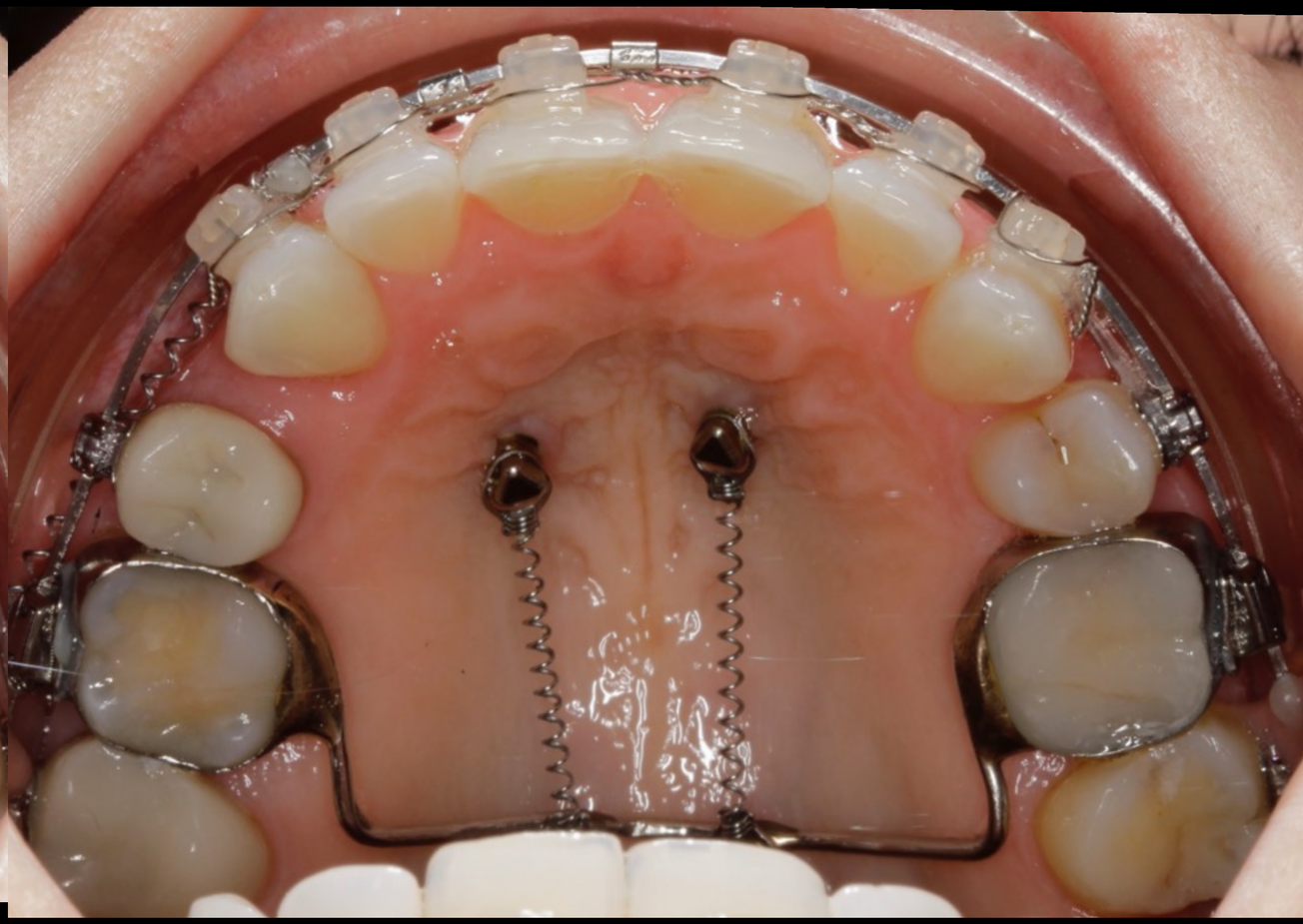


Finals

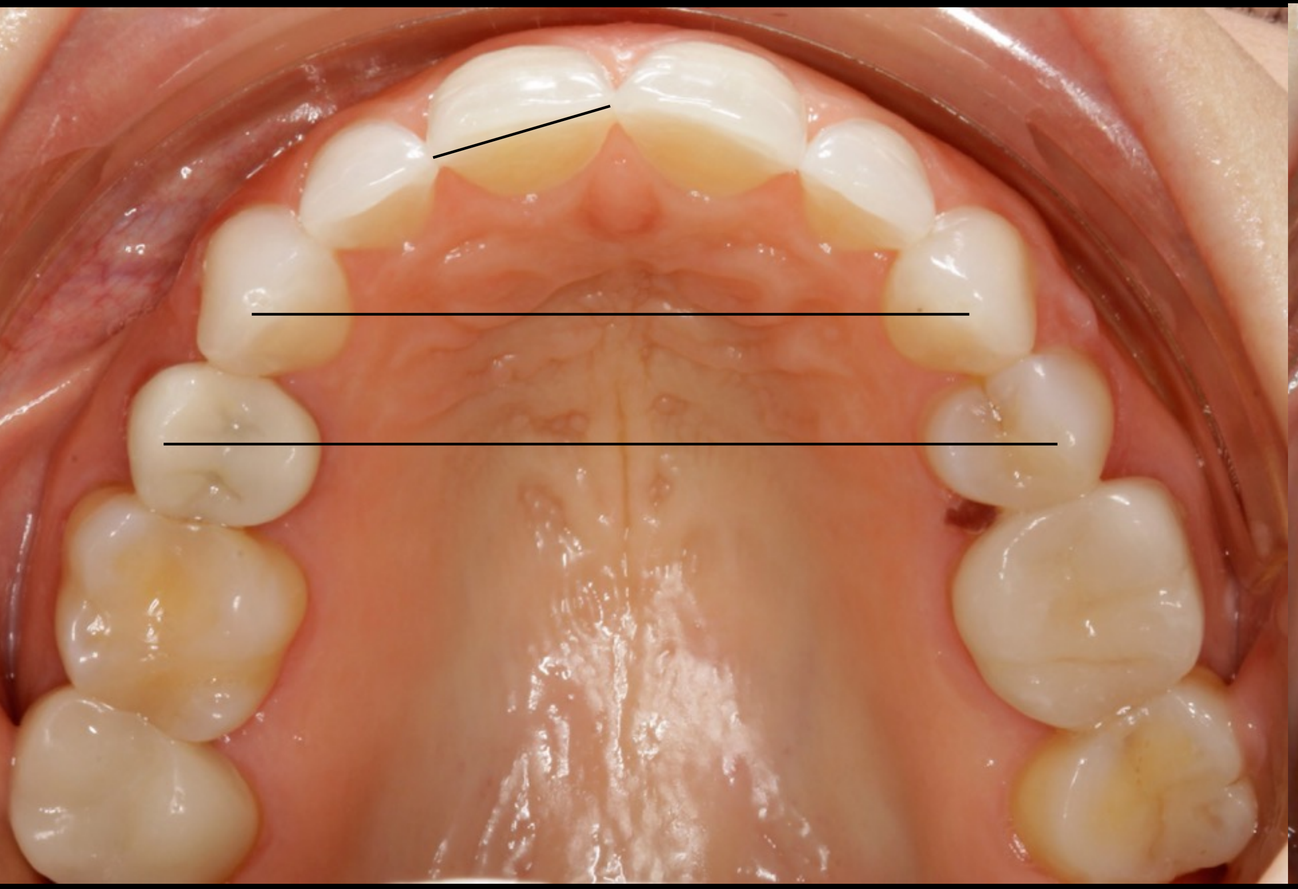
16 Months in Treatment

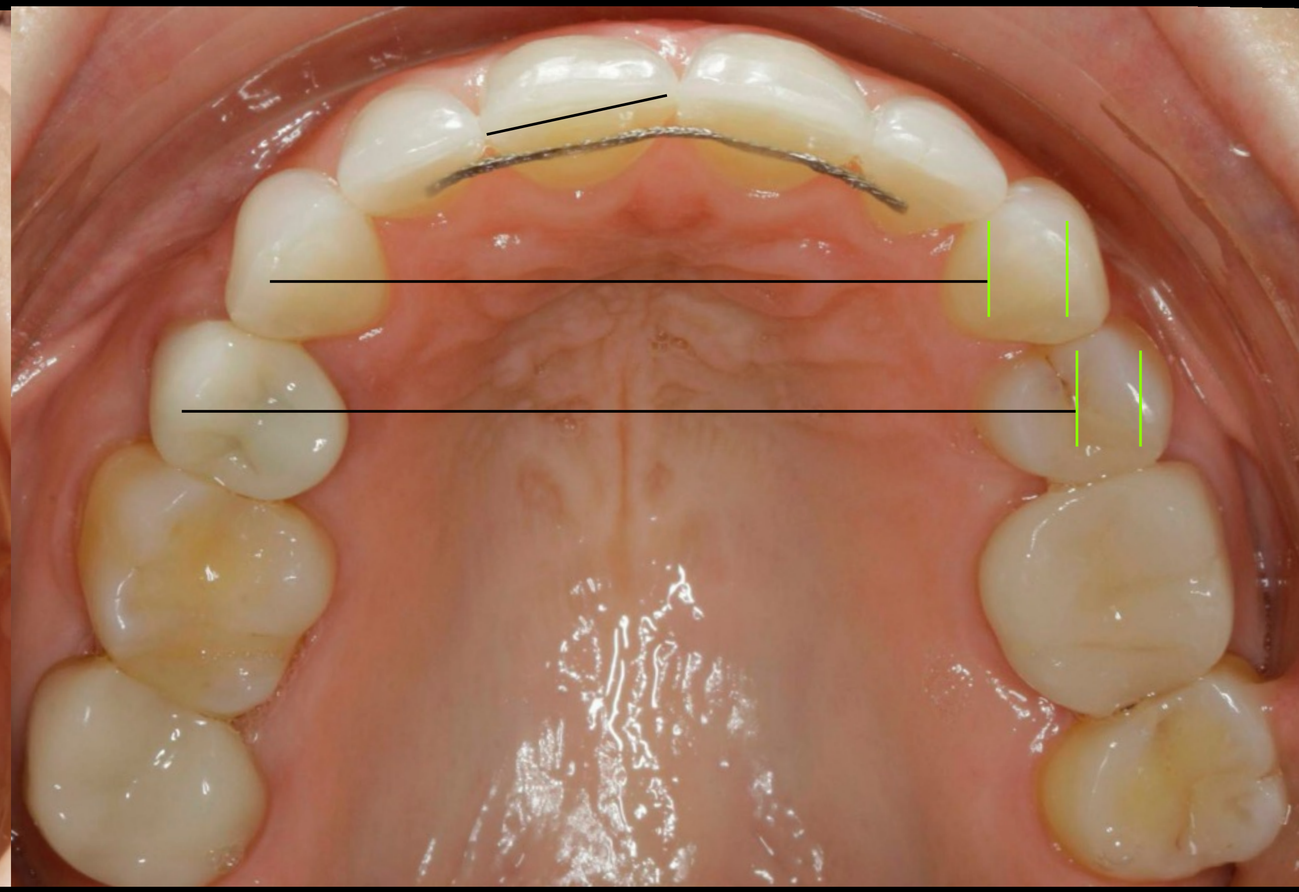


14 Months



16 Months





2011

AcceleDent

AcceleDent®





- 25 grams of force at 30 Hz
- Single-user prescription device
- Patients use at home for 20 minutes daily throughout treatment

AcceleDent®

FAST. SAFE. GENTLE.

- **IT'S FAST.**

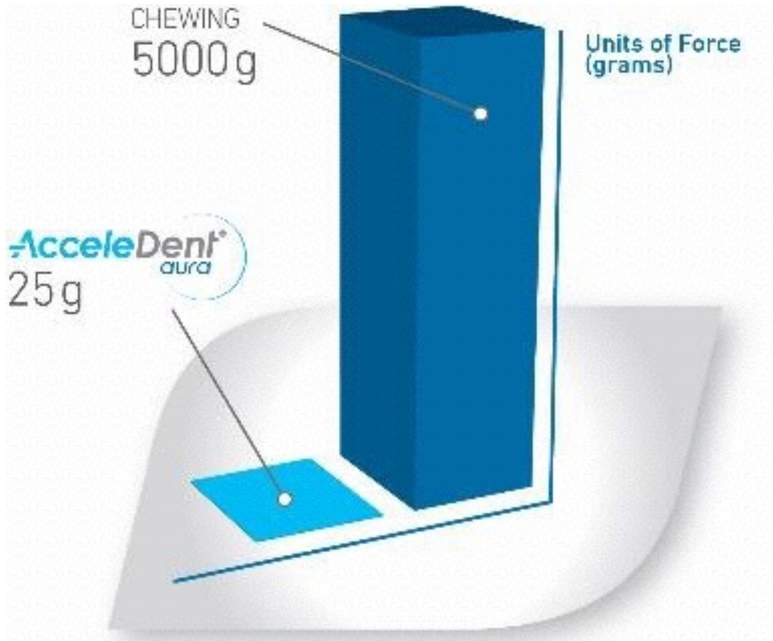
  Clinically proven to move teeth up to 50% faster in a double-blinded randomized controlled clinical trial.

- **IT'S SAFE.**

  Cleared by the United States Food and Drug Administration and available only by prescription from an orthodontist. Zero adverse events reported with over 40,000 units shipped globally.

- **IT'S GENTLE.**

  SoftPulse Technology® micropulses are gentle and exert 200x less force to teeth than ordinary chewing.



AcceleDent Aura offers gentle vibration to accelerate tooth movement

HOW IT WORKS: 101

FAST

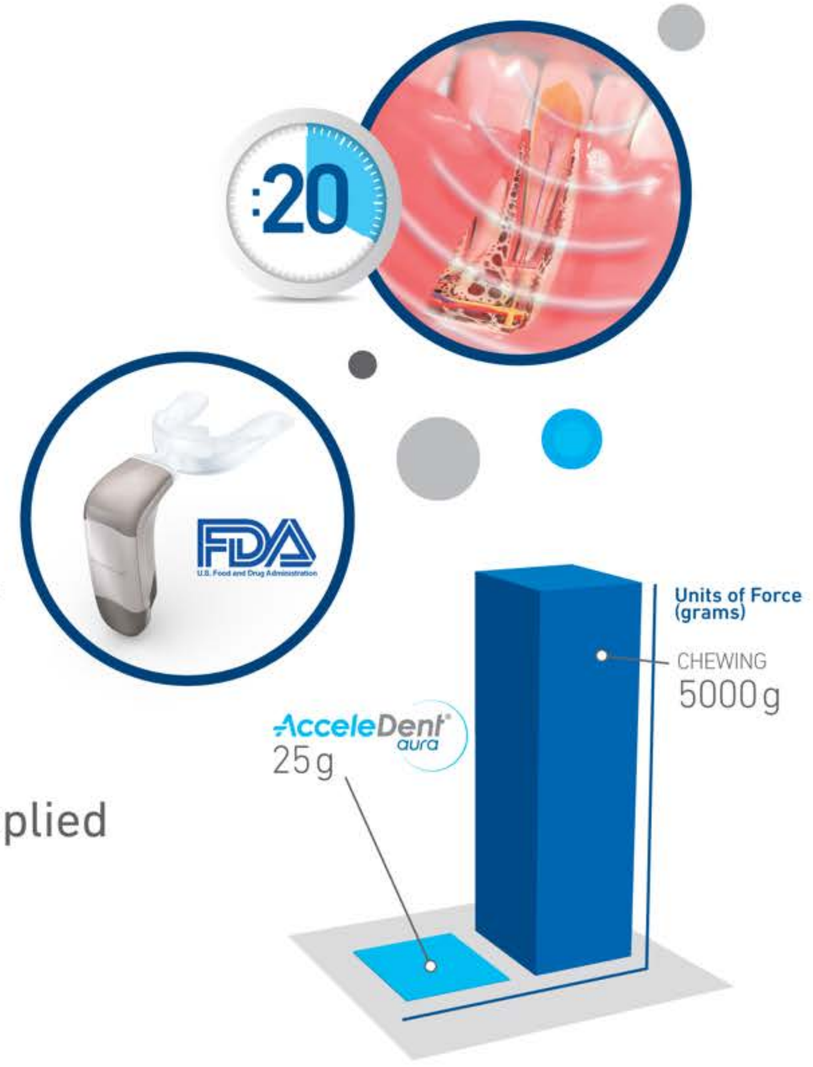
Innovative SoftPulse Technology® safely accelerates tooth movement up to 50% with just 20 minutes daily use.

SAFE

Class II, FDA-cleared medical device demonstrated safe and reliable in U.S. trials.

GENTLE

Soft pulsation is 200x less force than that applied by chewing, and patients report much less discomfort with AcceleDent®.



Science Background

Pulsatile Forces - Orthopedics

- Since the mid-1980s, pulsatile stimulation (vibration) of bone has been studied in the treatment of bone fractures and osteoporosis
- These studies demonstrated an increased rate of facture healing and bone density in long bones
- AcceleDent was developed to apply the benefits of vibration to safely increase the rate of tooth movement during orthodontic treatment



Bone stimulation increases rate of healing process

Pulsatile Forces - Orthopedics

PULSATILE FORCES HAVE BEEN PROVEN TO ALTER PHYSIOLOGICAL RESPONSE IN LONG BONES

- Increased rate of **fracture healing**
- Increased cellular signaling to enhance **bone density**

JUVENT DYNAMIC MOTION THERAPY



EXOGEN® ULRASOUND BONE HEALING SYSTEM



THE JOURNAL OF BONE & JOINT SURGERY · JBJS.ORG | VOLUME 83-A · NUMBER 2 · FEBRUARY 2001

CURRENT CONCEPTS REVIEW

THE USE OF LOW-INTENSITY ULTRASOUND TO ACCELERATE THE HEALING OF FRACTURES

BY CLINTON RUBIN, PHD, MARK BOLANDER, MD, JOHN P. RYABY, BS, AND MICHAEL HADJIARGYROU, PHD

- Double-blind, prospective, placebo-controlled clinical trials demonstrate that healing times of fresh fractures of the radius and tibia are reduced by up to 40% with the use of low-intensity ultrasound.
- Animal studies indicate that low-intensity ultrasound exposure results in stronger and stiffer callus formation and in acceleration of the endochondral ossification process.
- Extensive clinical evidence demonstrates that ultrasound represents a safe, noninvasive method of accelerating the healing of fresh fractures of the tibia, the distal aspect of the radius, the scaphoid, and the metatarsals.
- Clinical studies indicate that ultrasound reduces the confounding effect of smoking and patient age on the fracture-healing process.
- Ultrasound requires a brief, twenty-minute, daily at-home treatment regimen and has no known contraindications.
- The effectiveness of low-intensity ultrasound has also been demonstrated in the clinical treatment of delayed unions and nonunions.

Osteoid 3D Printed Cast + Low Intensity Pulsed Ultrasound (LIPUS)



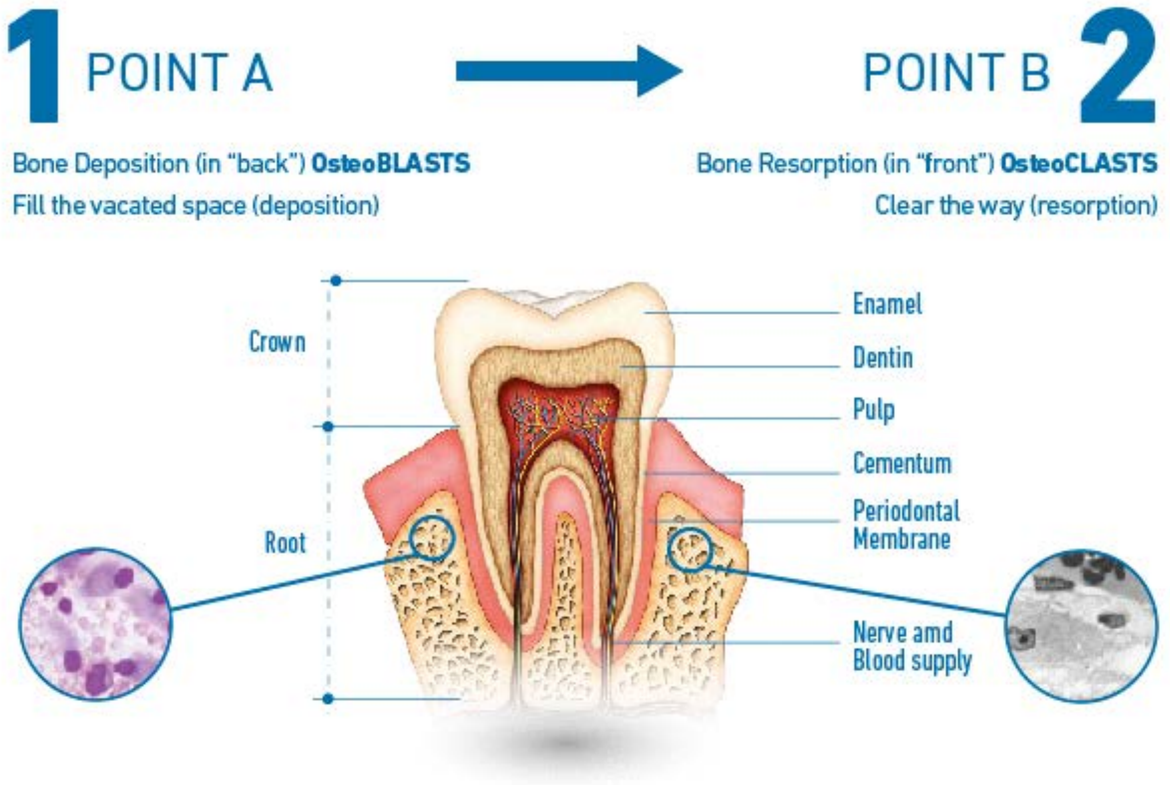


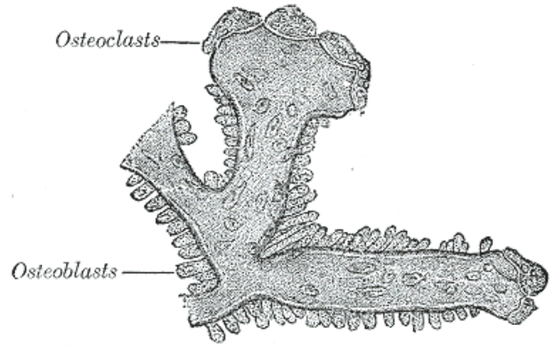
Combine this cast with the accompanying low-intensity, pulsed ultrasound (LIPUS) bone stimulator system (shown above) and, according to Karasahin:

> *For single 20 minute daily sessions this system promises to reduce the healing process up to 38% and increase the heal rate up to 80% in non-union fractures.*

Orthodontic Tooth Movement

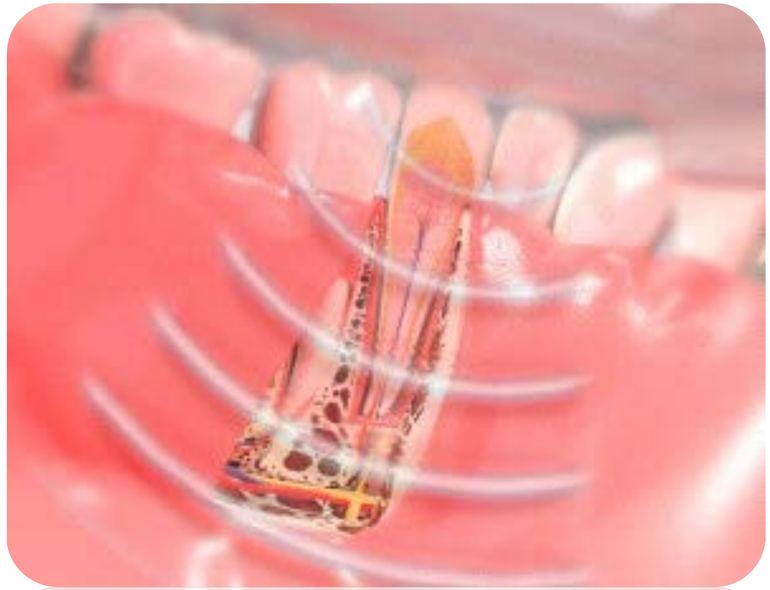
Moving the tooth from “left to right” (Point A to Point B,) requires bone remodeling by osteoclast (removing bone) and osteoblasts (creating bone).





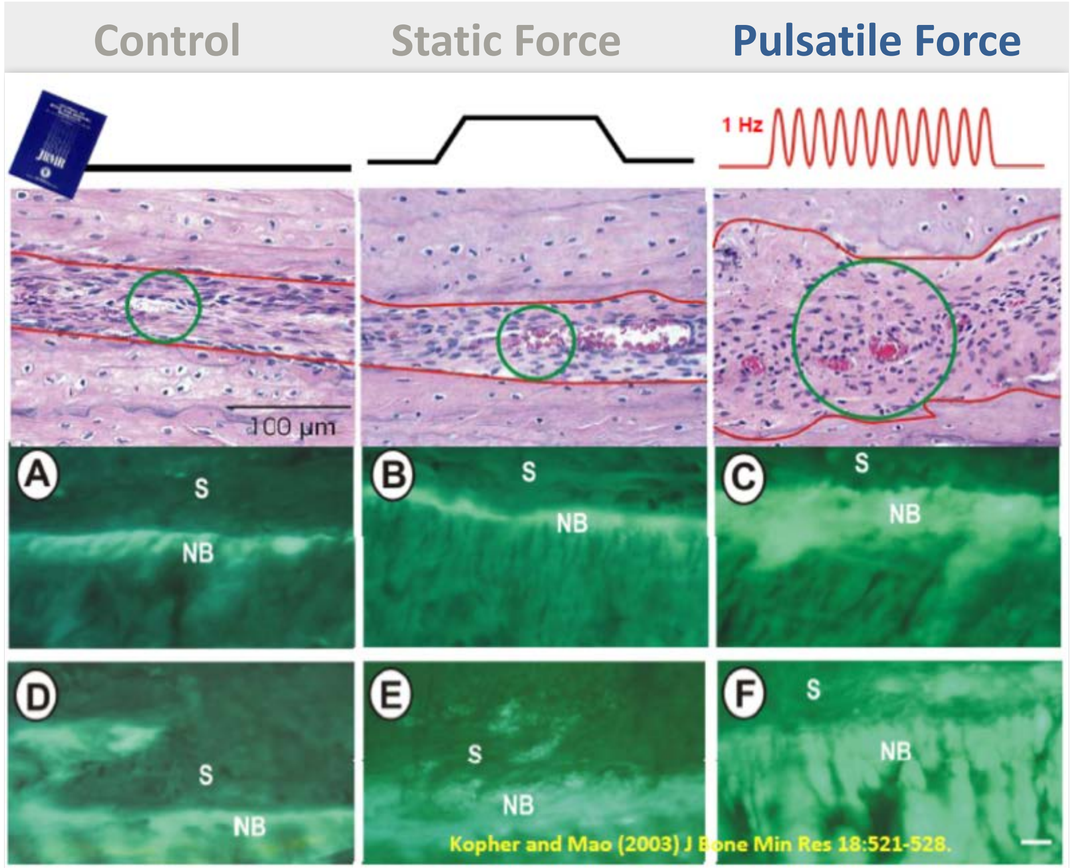
How AcceleDent Works

Pulsatile forces delivered by AcceleDent stimulate cellular activity and tissue physiology to increase the rate of bone remodeling, resulting in accelerated orthodontic tooth movement



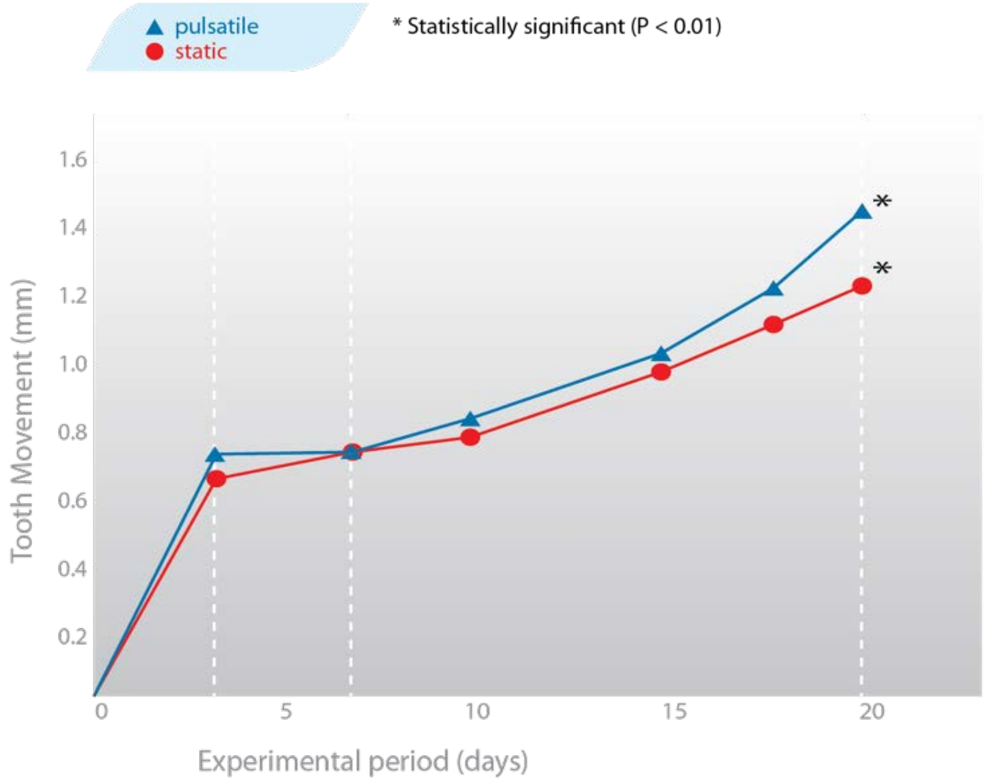
Effect of Pulsatile Forces

MODULATES CRANIOFACIAL SUTURE GROWTH IN ANIMAL MODEL



Effect of Pulsatile Forces

ALVEOLAR BONE REMODELING & TOOTH MOVEMENT



ANIMAL STUDIES

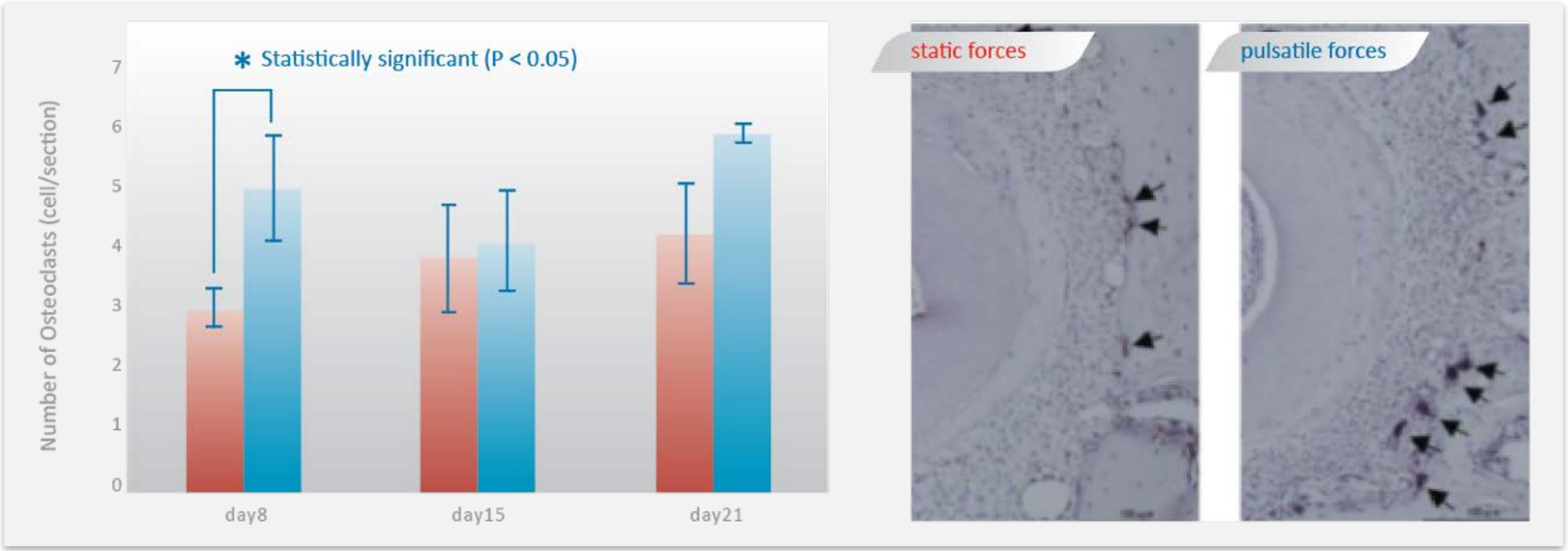
- Pulsatile forces increase bone remodeling up to 2.5x in animal cranial suture models[1-3]
- Faster tooth movement was observed with pulsatile forces when compared to static forces in direct tooth models in rats[4,5]
- No increased root resorption with pulsatile force groups

1. Kopher RA and Ma JJ. Suture growth modulated by the oscillatory component of micromechanical strain. 2003. J. Bone and Res. 18 (3). pp. 521-528.
2. Peptan AI, et. al. Responses of intramembranous bone and sutures upon in-vivo cyclic tensile and compressive loading. 2008. Bone (42) pp. 432-438.
3. Vij K. and Mao, JJ. Geometry and cell density of rat craniofacial sutures during early postnatal development and upon in-vivo cyclic loading. 2006. Bone (38) pp. 722-730.
4. Nishimura et. al. Periodontal tissue activation by vibration: Intermittent stimulation by resonance vibration accelerates experimental tooth movement in rats. 2008. Am J Orthod Dentofacial Ortho p 133 (4) pp. 572-583.
5. Darendeliler MA, Zea A, Shen G, Zoellner H. Effects of pulsed electromagnetic field vibration on tooth movement induced by magnetic and mechanical forces: a preliminary study. Australian Dental Journal 2007;52:(4):282-287.

Effect of Pulsatile Forces

INCREASE BONE CELLULAR ACTIVITY

Pulsatile forces stimulate bone metabolism molecules that regulate the quantity and activity of osteoclasts & osteoblasts[1].



Factors that increase the rate of bone remodeling also increase the rate of tooth movement

1. Nishimura et. al. Periodontal tissue activation by vibration: Intermittent stimulation by resonance vibration accelerates experimental tooth movement in rats. 2008. Am J Orthod Dentofacial Ortho p 133 (4) pp. 572-583.

Scientific Literature Established

AUTHORS	YEAR	JOURNAL	MODEL	KEY OUTCOME
Shapiro, et. al.	1979	AJO-DO	Human (n=1)	Tooth movement rate increase
Shimizu	1986	J. Japan. Ortho. Society	Monkey	Tooth movement increase
Mao and Kopher	2003	J. Bone Mineral Res.	Rabbit	Bone Remodeling increase
Mao, et. al.	2005	Frontiers Biosc.	Rabbit	Bone Remodeling increase
Collins, et. al.	2005	J. Biomech.	Rat	Gene Expression increase
Mao and Tang	2006	Cell & Tiss. Res.	Rat	Gene Expression increase
Mao and Vij	2006	Bone	Rat	Bone Remodeling increase; Osteoblast increase; Osteoclast increase
Almubarak, et. al.	2006	Cell & Tiss. Res.	Rat	Gene Expression increase
Darendeliler, et. al.	2007	Aus. Dent. J	Rat	PEMF induced increase rates of tooth movement
Mao and Peptan	2008	Bone	Rabbit	Bone Remodeling increase rates of tooth movement
Nishimura et. al.	2008	AJO-DO	Rat	Tooth movement rate increase; Osteoclast increase
Liu	2010	AADR/CADR; pre-publication	Rat	Accelerated tooth movement
Liu	2011	IADR/AADR/CADR; pre-publication	Rat	Accelerated tooth movement
Bowman	2014	JCO	Human (n=117)	Accelerated tooth movement
Leethanakul et. al.	2015	Angle	Human (n=15)	Accelerated tooth movement; Gene expression increase
Pavlin et. al.	2015	Seminars in Orthodontics	Human (n=45)	Accelerated tooth movement
Orton-Gibbs et al.	2015	JCO	Human (n=117)	Accelerated tooth movement
Uribe et al.	2015	AJO-DO	Human (n=1)	Accelerated tooth movement
Lobre et al.	2015	Angle	Human (n=58)	Reduce pain perception



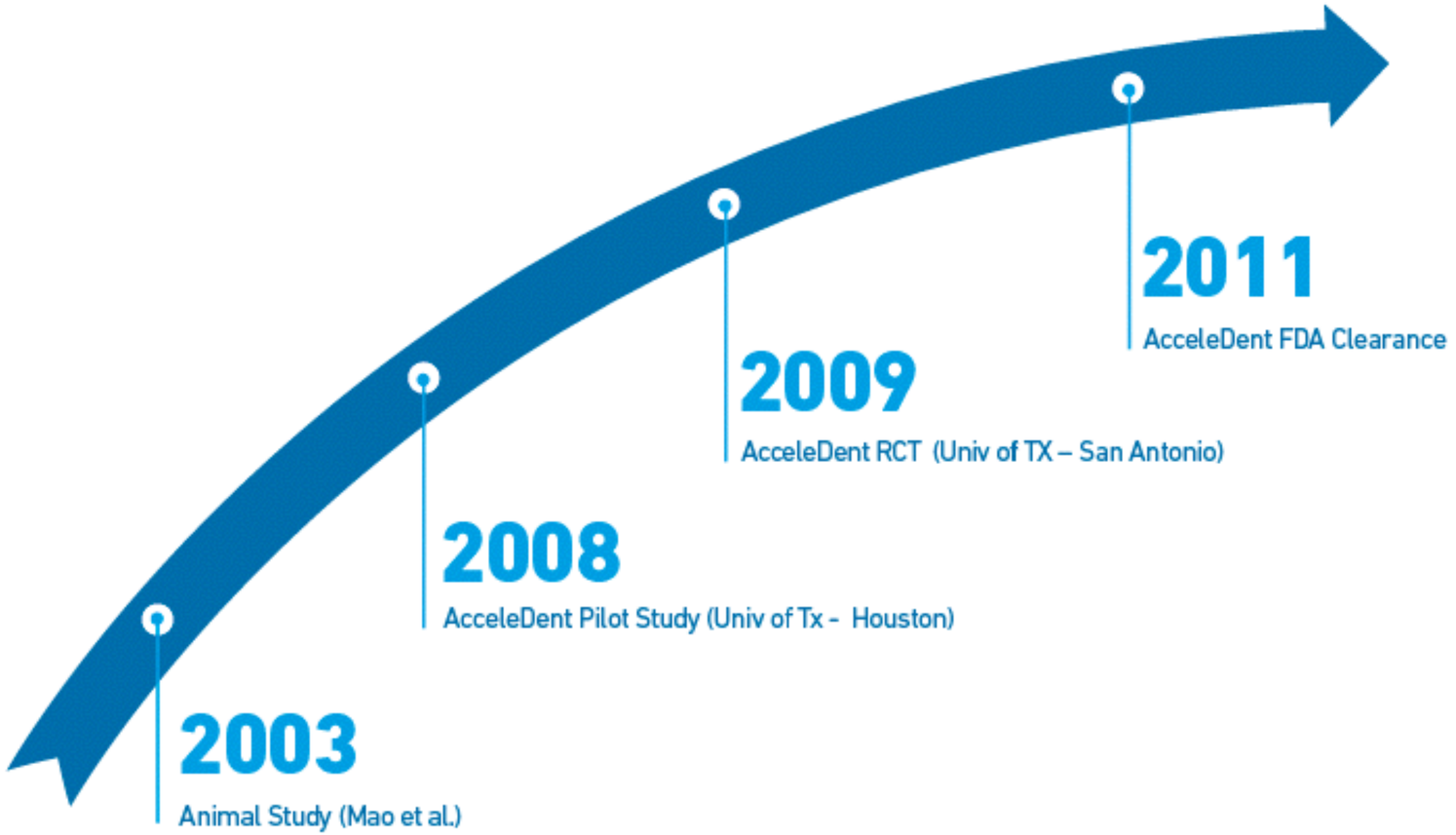






An Evidence Based Approach

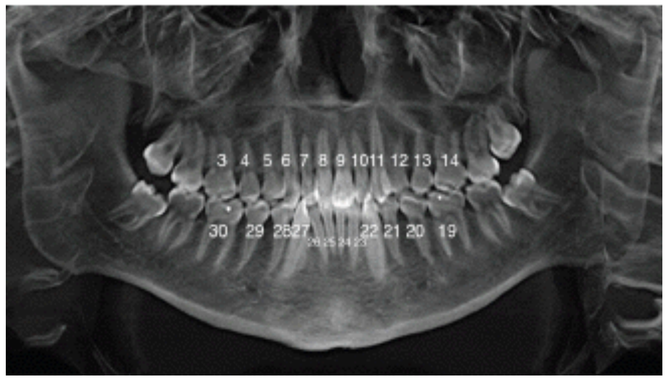
STUDYING FASTER TOOTH MOVEMENT WITH ACCELEDENT®



AcceleDent® Pilot Study

The University of Texas
Health Science Center at Houston
Dental Branch

- Prospective, interventional study (n=17 pts)
- Tooth alignment 75% faster than the highest published historical rate
- Extraction space closure 30% faster than the highest historical rate
- No clinically relevant root resorption



Kau: A radiographic analysis of tooth morphology following the use of a novel cyclical force device in orthodontics. Head & Face Medicine 2011 7:14.

AcceleDent Randomized Controlled Trial

WE MAKE LIVES BETTER
UT HEALTH SCIENCE CENTER®
SAN ANTONIO

- Prospective, double-blinded, randomized, controlled trial (n=45 pts)
- Orthodontic patients treated with fixed appliances
- Patients randomized to either active or inactive (sham) AcceleDent
- Study protocol was pre-approved by the U.S. Food and Drug Administration (FDA).
- Study meets all CONSORT requirements (Consolidated Standards on Reporting Trials) for biomedical publications.

AcceleDent Randomized Controlled Trial

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SAN ANTONIO

Inclusion Criteria

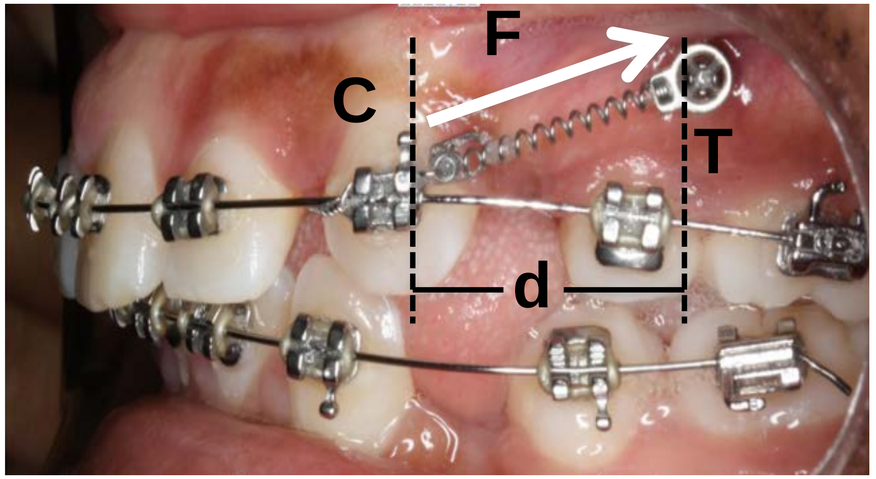
- Between 12 and 40 years of age
- Treatment plan - requiring extraction of at least one maxillary first premolar with a maximum posterior anchorage
- At least **3 mm of extraction space** that needed to be closed by distal movement of the canines

Exclusion Criteria

- Periodontal disease and/or medical conditions known to affect tooth movement
- Patients on prescription medications
- Pregnancy

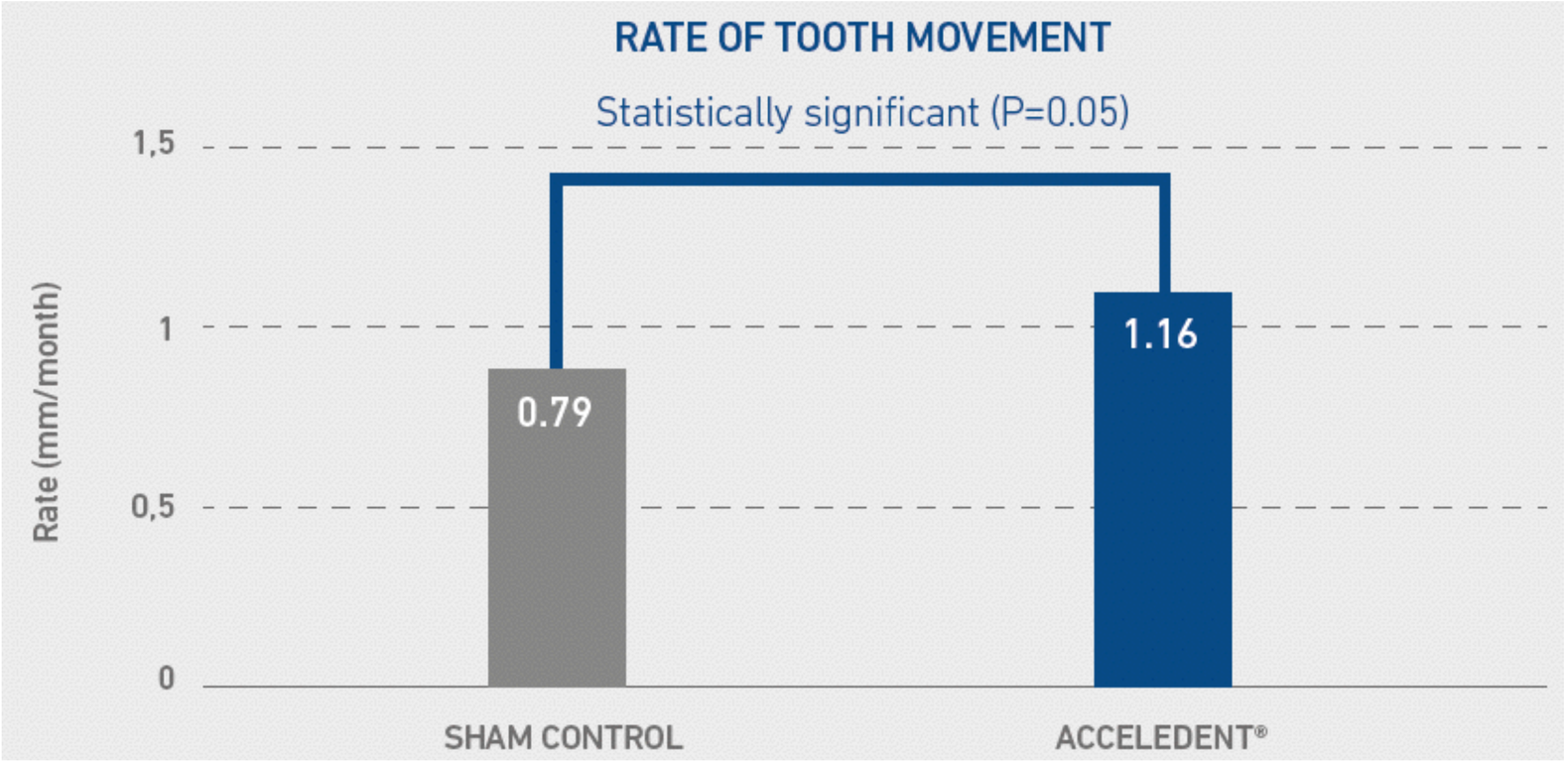
Data Collection and Measurements

- Regular orthodontic records and appointment schedule
- Distance measurement every 4 weeks on average
- Progress and final panoramic radiograph



AcceleDent Randomized Controlled Trial

WE MAKE LIVES BETTER
UT HEALTH SCIENCE CENTER®
SAN ANTONIO



- **Clinically proven to accelerate tooth movement in a randomized controlled clinical trial**
- **No clinically relevant root resorption**

Pavlin D et al. Cyclic loading (vibration) accelerates tooth movement in orthodontic patients: A double-blind, randomized controlled trial. Seminars in Orthodontics, Volume 21, Issue 3, 187 – 194.

The Effect of Vibration on the Rate of Leveling and Alignment

Bowman SJ. J Clin Orthod. 48:11 (2014): 678-688.

- Retrospective evaluation of the effects of vibration on the time required for mandibular leveling and alignment

- Enrolled 117 consecutively treated Class II non-extraction patients (40% male)
  - AcceleDent group (N=30, 13.1 ± 1.3 yrs)
  - Study control group (N=37, 12.8 ± 1.0 yrs)
  - Pre-AD control group (N=50, 14.3 ± 4.2 yrs)

- Alignment
  - Time to seat a rectangular .017" × .025" archwire into .022" × .028" brackets

- Leveling
  - Time to seat a rectangular .019" × .025" archwire into .022" × .028" brackets



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The Effect of Vibration on the Rate of Leveling and Alignment

S. JAY BOWMAN, DMD, MSD

Numerous concepts have been developed with the aim of increasing the speed of orthodontic tooth movement and potentially reducing overall treatment time. Unfortunately, most have failed to generate the supporting data needed to gain wide acceptance.[1,2] Even if treatment time were not a significant issue for many patients and practitioners,[3] the prospect of improving the effectiveness of biomechanics through enhanced tooth movement would be a worthy goal that warrants further clinical investigation.

The purpose of this study was to evaluate the effects of vibration with AcceleDent® (Fig. 1) on the speed of orthodontic leveling and alignment.

Biological and Mechanical Effects of Vibration

As early as 1979, Shapiro and colleagues reported the use of pulsating force-induced piezoelectricity to stimulate tooth movement.[4] In 1982, Kurz received a patent for a vibrating headgear/mouthpiece device.[5] In 1986, investigators at the Children's Clinical Hospital No. 2 of Kiev concluded that vibration at 50Hz for 60-360 seconds every two or three days reduced the time needed to move a tooth by a factor of 1.5-2 times.[6] Although academic interest in the orthodontic effects of vibration waned until the beginning of the 21st century, it persisted in orthopedic medicine.

Beginning in 2003, animal studies demonstrated an increased natural response[7,8] and more rapid tooth movement after vibratory stimulation.[9,10] One investigation did find an inhibition of translational tooth movement in rats during a brief two-week experimental period,[11] but another reported a 40% increase in the rate of tooth movement in mice after light daily vibration over four weeks.[12] Since vibration stimulates inflammation, these animal models suggested the potential to alter the periodontal apparatus or create osteogenic effects[13] through genetic expression, cytokine activity, cellular changes,[14] or recruitment, thereby enhancing tooth movement.

*Registered trademark of OrthoAccel Technologies, Bellaire, TX; www.acceledent.com.

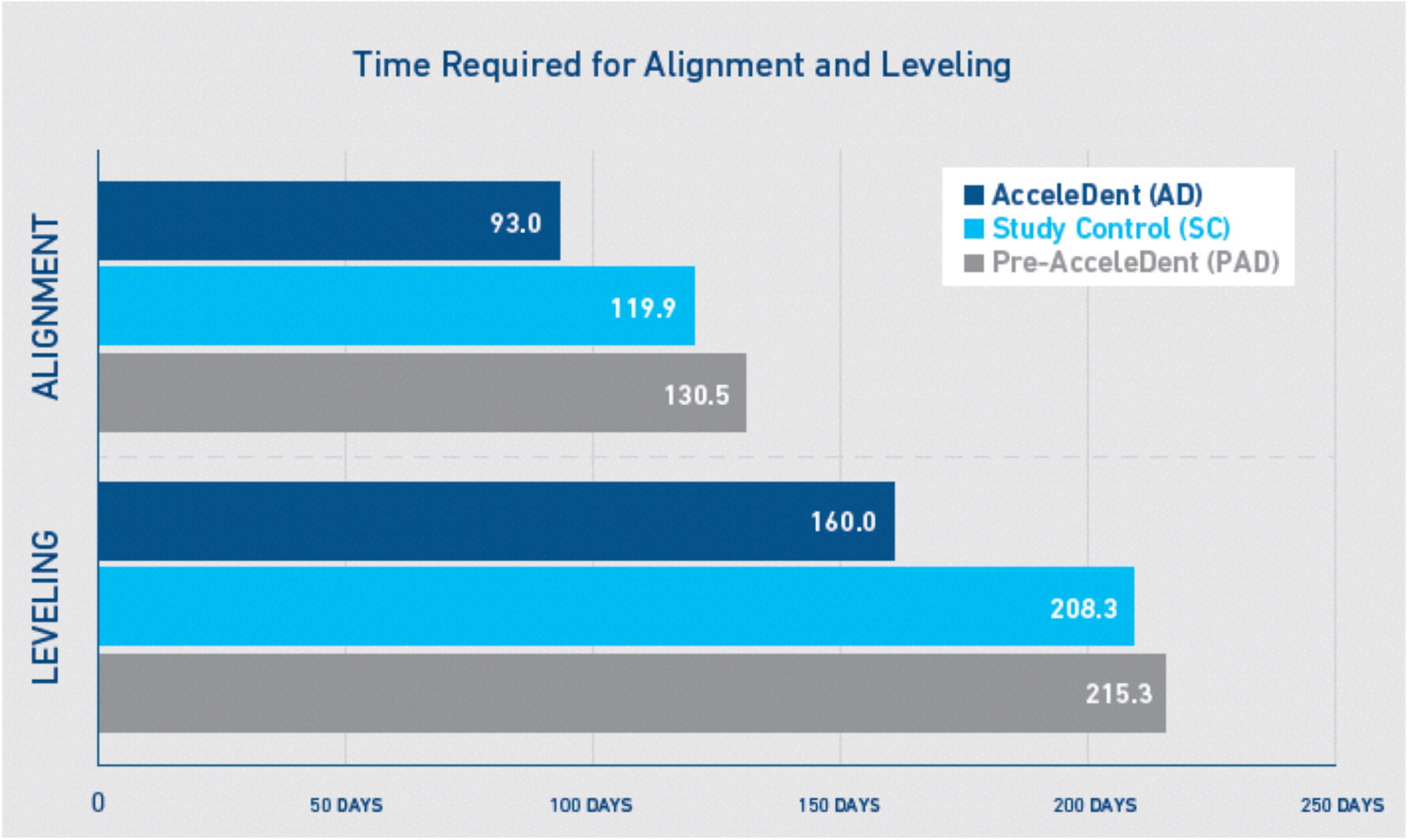
TABLE 1
DEMOGRAPHICS

	AcceleDent (AD)	Study Control (SC)	Pre-AD Control (PAD)	p
N	30	37	50	
Male	13 (43.3%)	12 (32.4%)	22 (44.0%)	0.5092*
Female	17 (56.7%)	25 (67.6%)	28 (56.0%)	
Mean age	13.1 ± 1.3 years	12.8 ± 1.0 years	14.3 ± 4.2 years	0.0579**

*Chi-square testing.
**Analysis of variance. In pairwise comparisons using t-tests with Bonferroni correction, only SC vs. PAD (p < .0166) was statistically significant.

The Effect of Vibration on the Rate of Leveling and Alignment

Bowman SJ. J Clin Orthod. 48:11 (2014): 678-688.



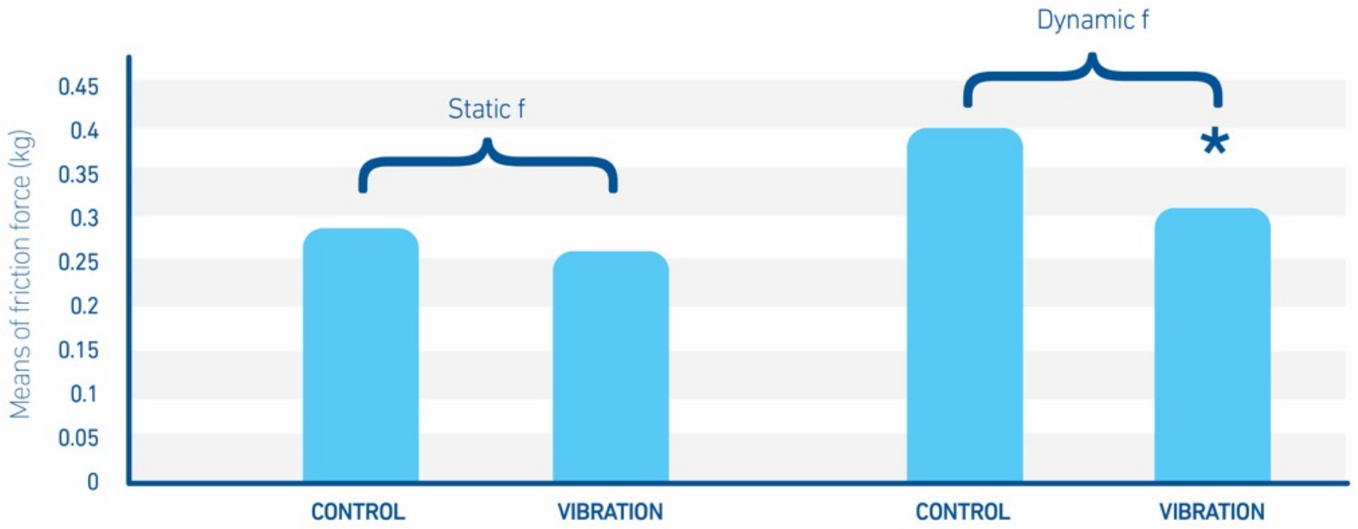
AcceleDent may accelerate time to alignment and leveling in Class II non-extraction patients.

Effect of Mechanical Vibration on Resistance to Sliding in the Fixed Orthodontic Appliance

Kennedy D, Liu D. Electronic poster session presented at 2014 AAO

ACCELEDENT® AND EFFICIENCY OF FIXED APPLIANCES

AcceleDent may enhance efficiency of fixed mechanics by reducing friction



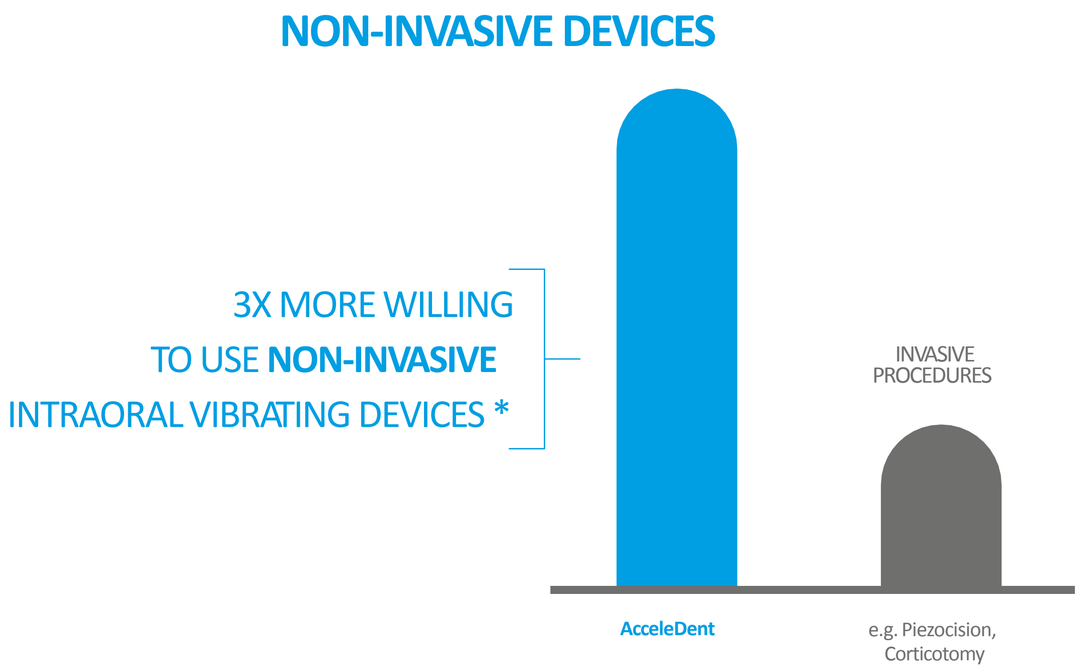
With AcceleDent, static and dynamic friction between orthodontic wire and brackets in a fixed appliance system were reduced by 8.5% and 22.3% ($p<0.05$), respectively.*

*Liu D, Kennedy D. Effect of Mechanical Vibration on Resistance to Sliding in the Fixed Orthodontic Appliance. Electronic poster session presented at: 2014 Annual Session of the American Association of Orthodontists; 2014 Apr 25-29; New Orleans, LA.

Why AcceleDent?

Patient Demand

PATIENTS DESIRE NON-INVASIVE ACCELERATED TREATMENT



*A VAST MAJORITY OF CONSUMERS ARE WILLING TO PAY

UP TO 20% MORE FOR REDUCED TREATMENT TIME

* Uribe F, Padala S, Allareddy V, Nanda R. Patients', parents', and orthodontists' perceptions of the need for and costs of additional procedures to reduce treatment time. Am J Orthod Dentofacial Orthop 2014;145:S65-73.



Researches had shown that vibrations can help bone remodeling and making treatment faster. Hard to prove, but worth a try.

Easy to use for any patient with orthodontic braces either fixed or removable like clear aligners.

BITEPOD 10 at $75

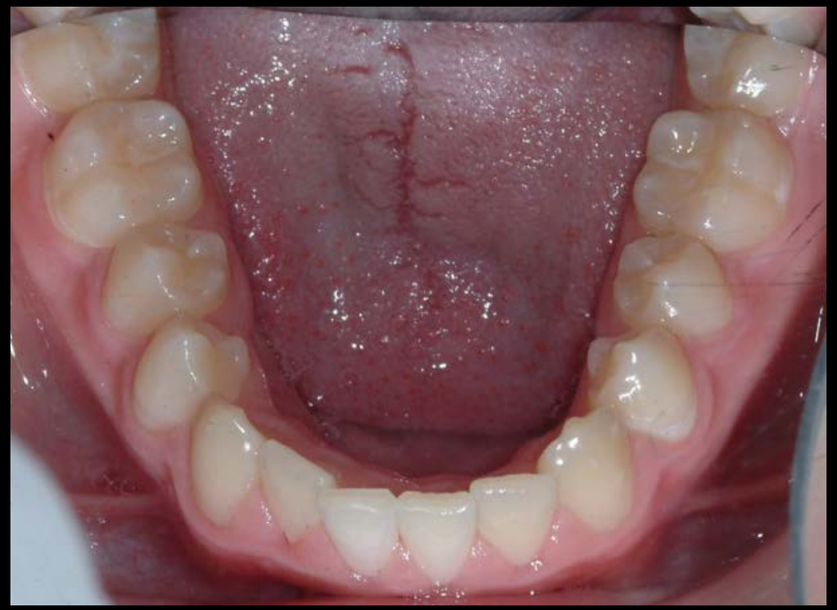


Buy Now



S.P.
15.2 Years
Initial

















S.P.
6 Months
6 Appointments
Final



















T.G.
45.5 Years
Initial









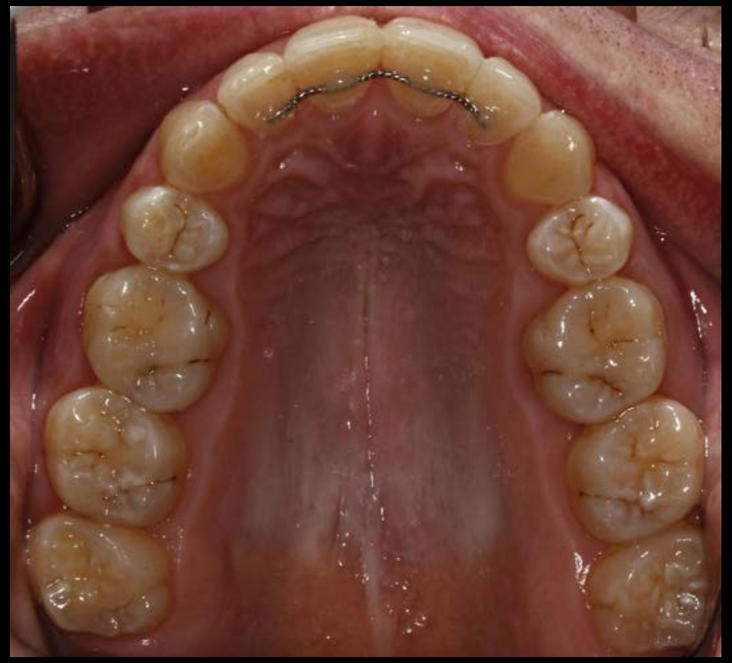








T.G.
4 Months
4 Appointments
Final





















N.A.
41 Years
Initial









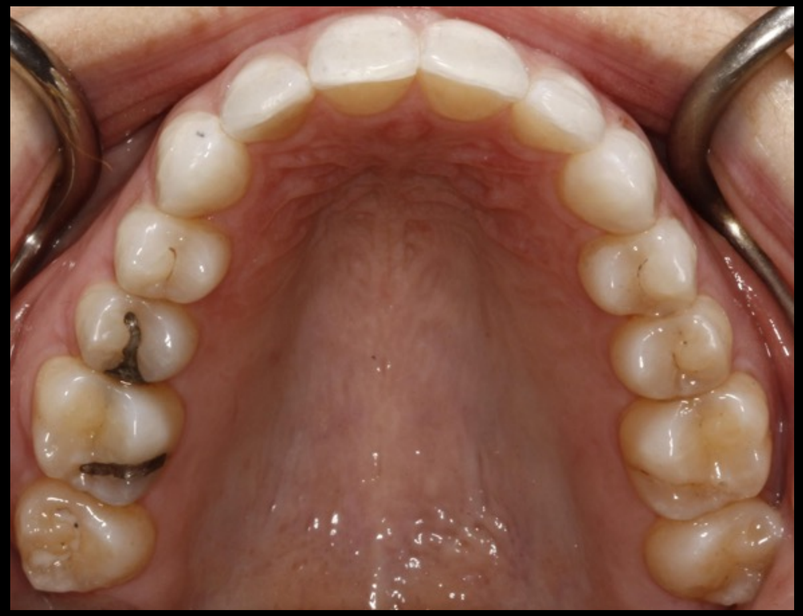








N.A.
5 Months
6 Appointments
Final



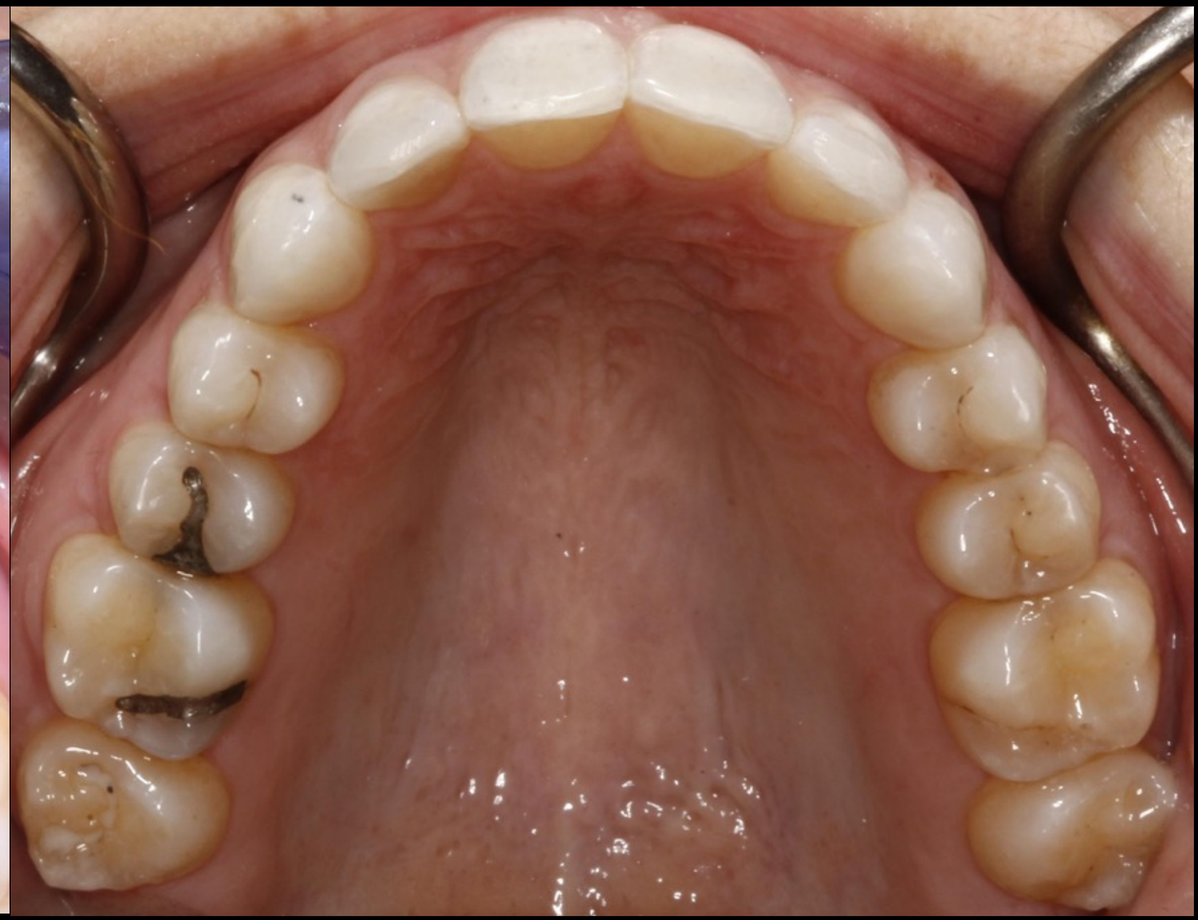


















K.H.
37.7 Years
Initial









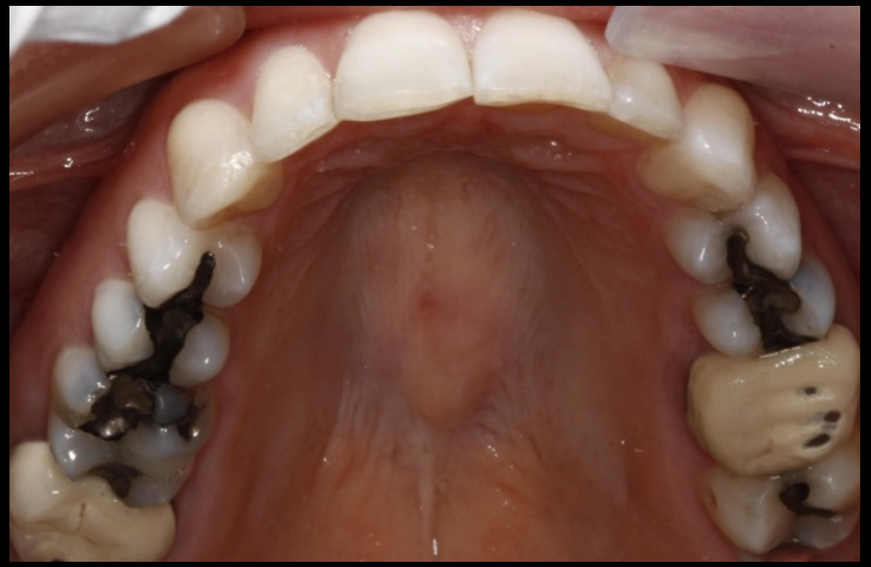








K.H.
7.5 Months
8 Appointments
Final















2016

BioLux

OrthoPulse®

LIGHT ACCELERATED ORTHODONTICS

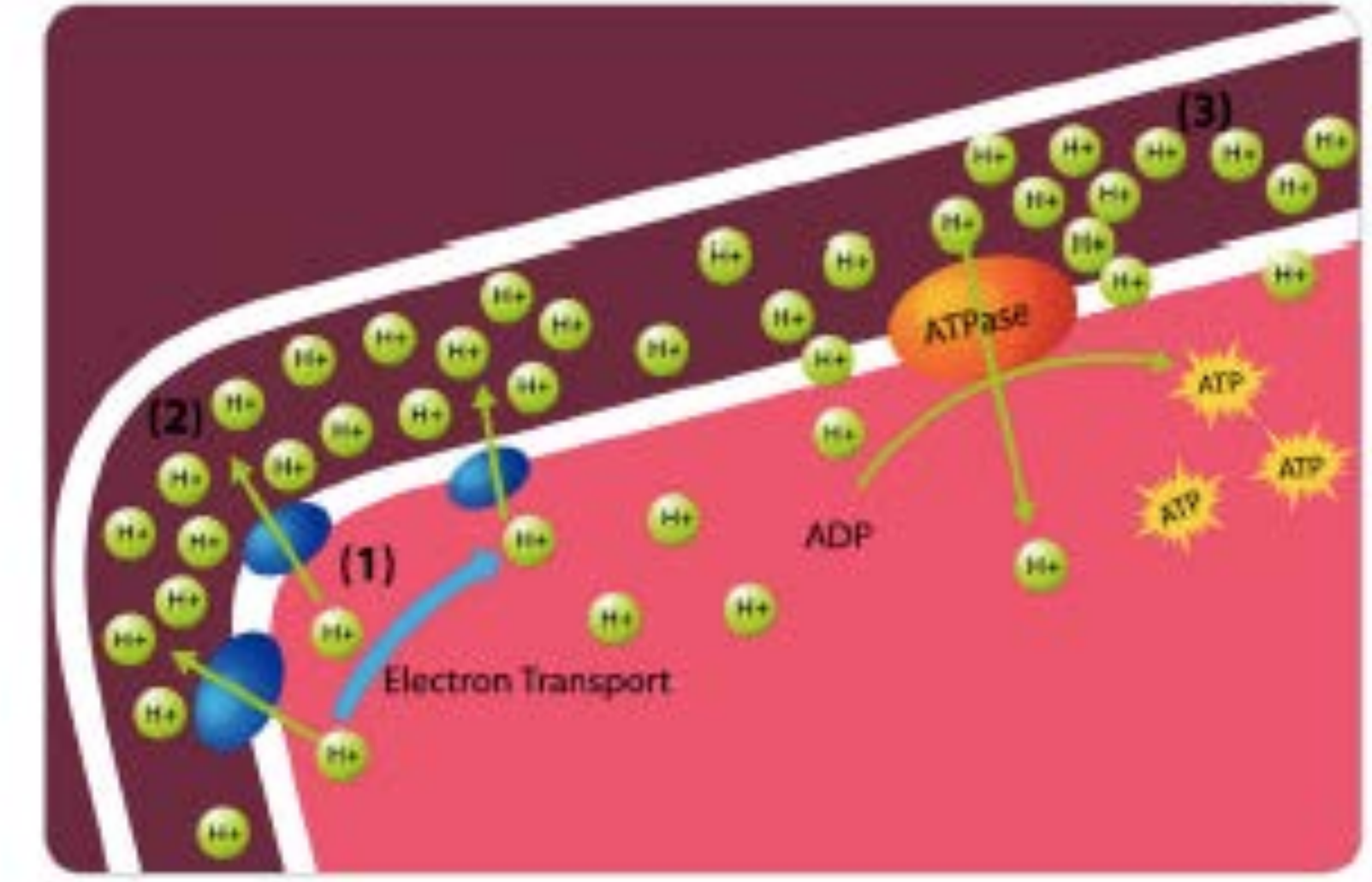


BIOLUX RESEARCH

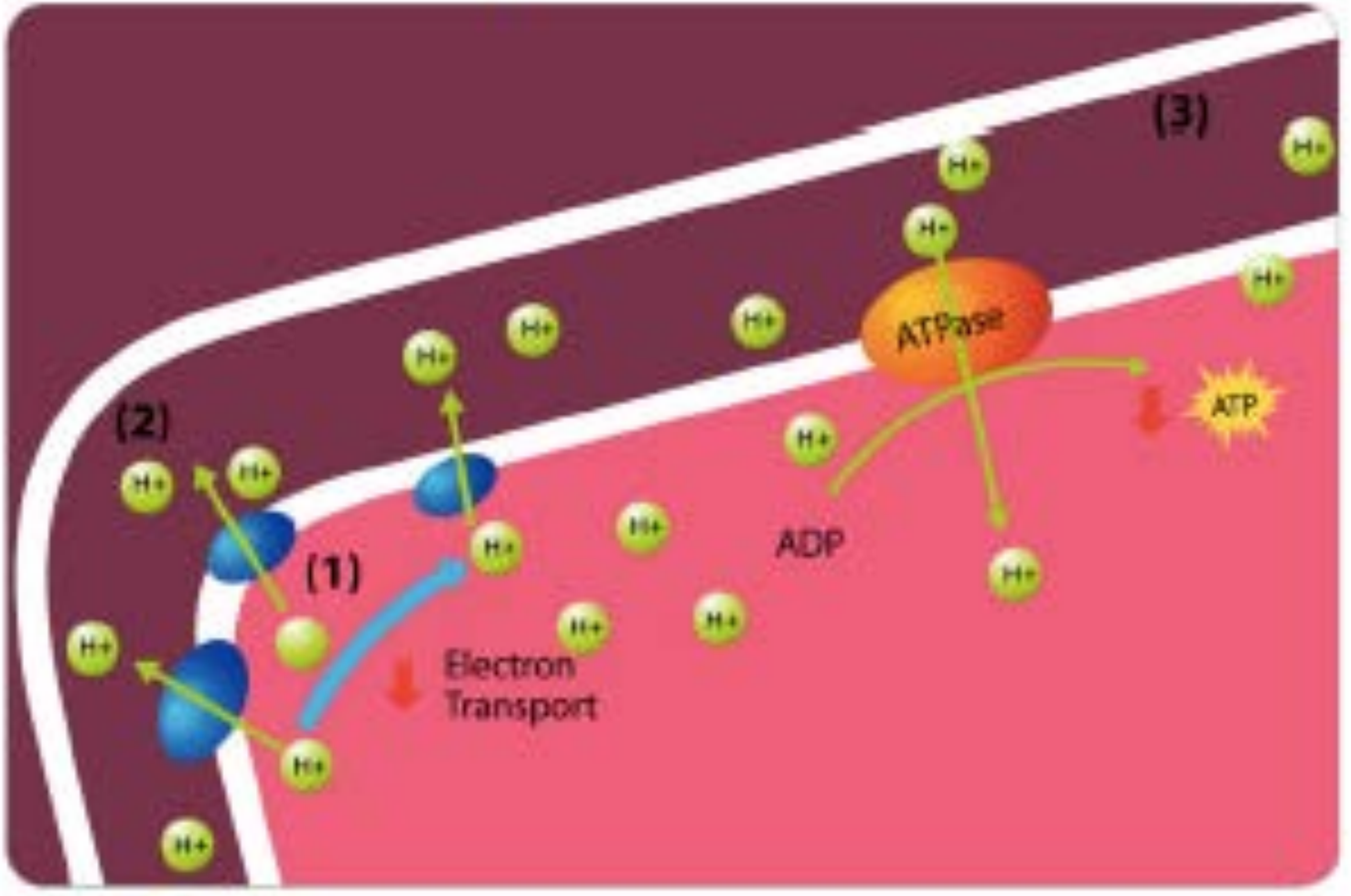




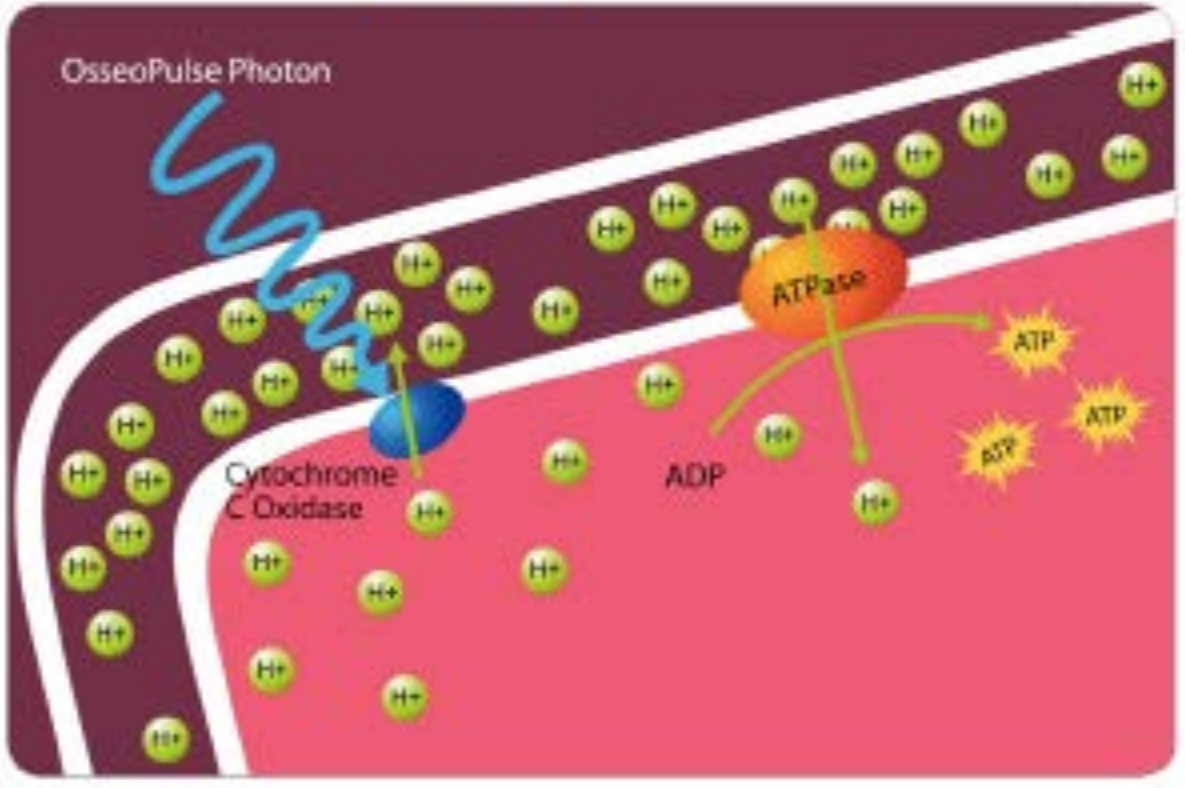
ATP production is driven by a high proton concentration in the inner mitochondrial membrane



Stressed cells have decreased metabolism, thus lower proton concentration and lower ATP production



Photobiomodulation increases ATP production by stimulating CCO to absorb photons and pump protons



As a result of increased energy ATP, mitochondrial signaling, and up/down regulation of genes. A plethora of tissue/cellular activity begins.

2016

VPro5

From Propel

VPro5™

Fast in 5 Minutes



Future?

THANK YOU!

It has been an HONOR
and
a PLEASURE
to be here with you tonight



Bill@Dischingerteam.com