Craniofacial Development and It's Affect on Airway Function

March 2024

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Accreditation Statement

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Conflict of Interest Disclosures for Speakers

Joseph G Bussell, DDS has no relevant financial relationships with ineligible companies to disclose.

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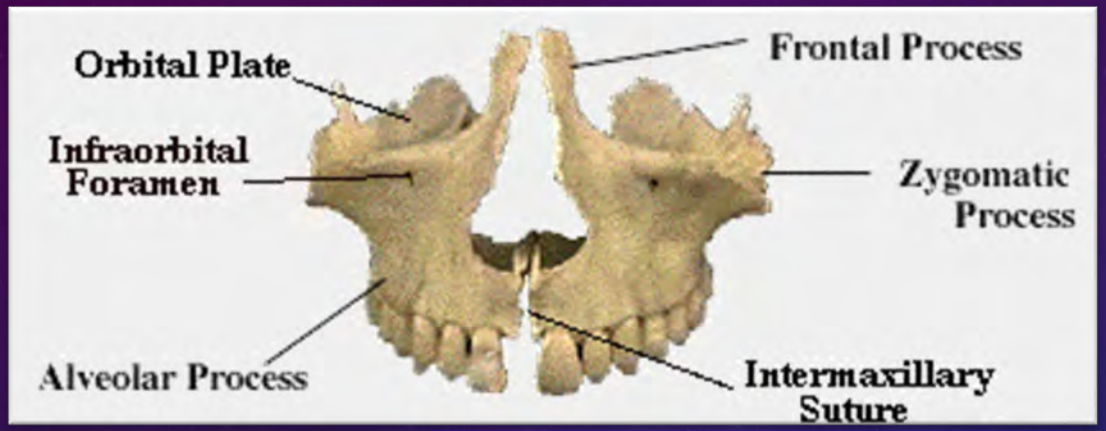
Learning Objectives

Upon completion of this course, attendees should be able to…

Understand Facial and Oral anatomy that affect OSA
Identifying insufficiencies in facial and oral development
Possible treatment modalities for facial and oral growth

Maxilla



* *Dermal bone* which develops from the ectoderm

* Function affects *Dermal bone* growth

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Maxilla

* 25% of the skeletal orbit.

* 85% of the nasal passage.
(Transversely & Vertically)

* Medial wall of the Ethmoid sinuses.

* “Houses” (surrounds) the mandible.

* Supports the maxillary dentition.

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Mandible

Length & Position
(Genetic)

Skeletal Class I

Skeletal Class III

Skeletal Class II mandibles are trapped Skeletal Class I Mandibles.

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Poiseuille's Law of "tubular flow"

The flow rate through a tube is proportional to the fourth power of the tube's radius.

If you double the diameter of a tube, you increase the flow rate through the tube by sixteen times.

AIR WAY OBSTRUCTION

Symptoms

Symptoms

1. Mouth Breathing
2. Chapped Lips & Gingivitis
3. Venous Pooling
4. Head Posture
5. Tonsil & Adenoids (Waldyer's Ring)
6. Reflux in the Eustachian Tube
7. Conductive Hearing Loss
8. Head and Neck Pain
9. Reduced Oxygen Blood Level

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Where is the obstruction???

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AIR WAY OBSTRUCTION

- The width & height of the Maxilla
- The Skeletal Class II
- The tonsils and adenoids
- The position of the Maxilla
  (Factor #1)
- The nasal turbinates and septum

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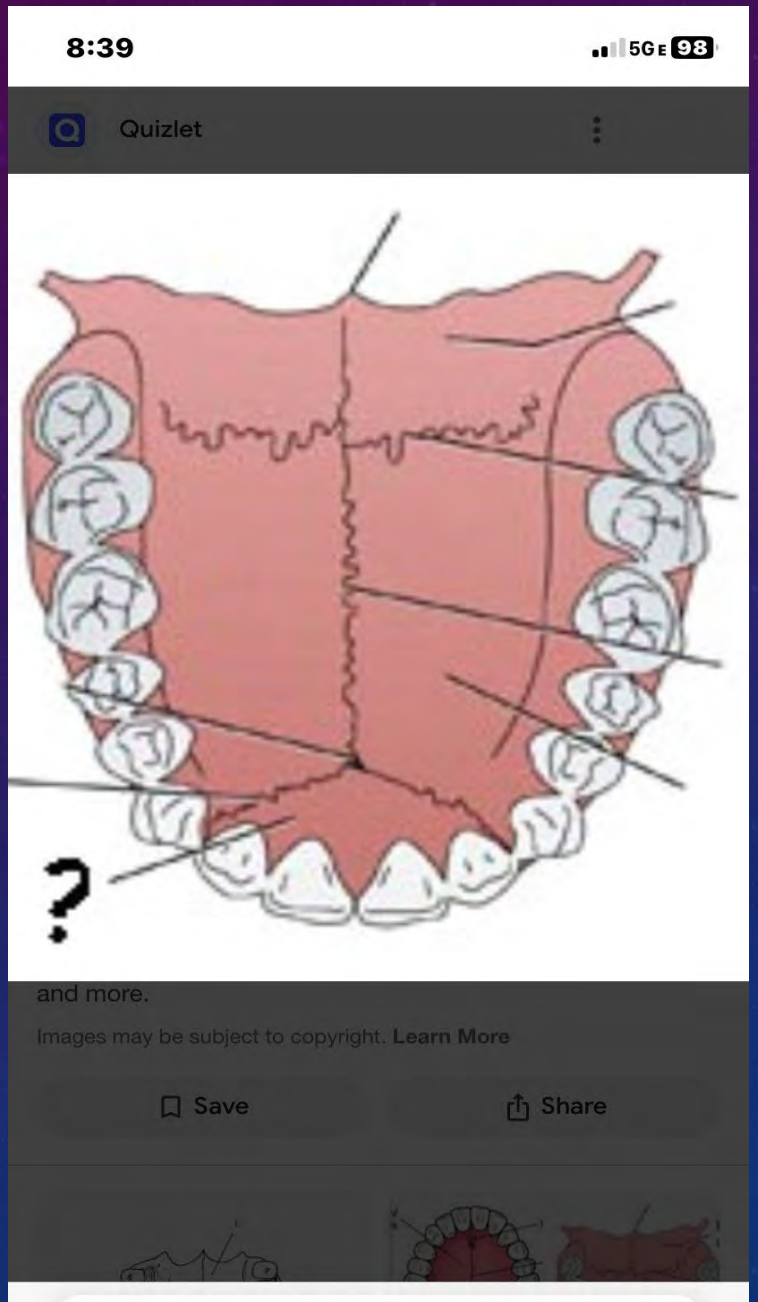

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Significant Bruxism

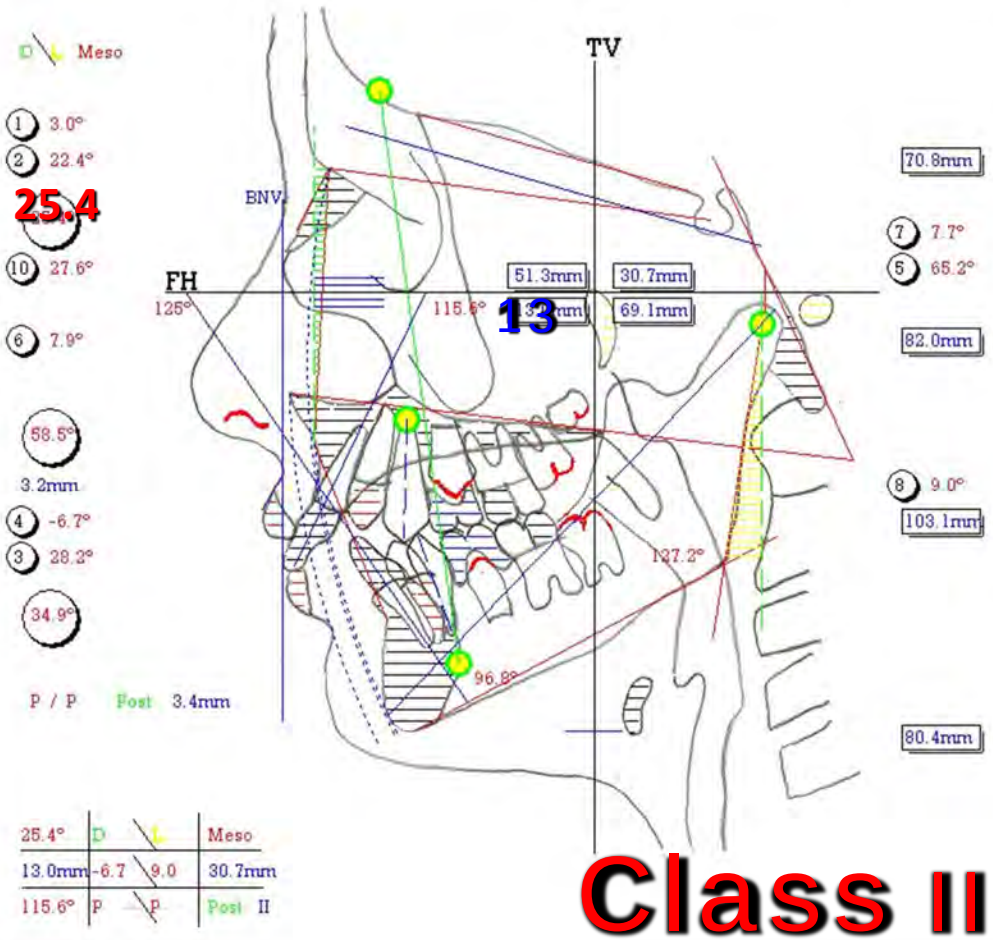
AIR WAY OBSTRUCTION

The width of the Maxilla
&
height of the vault

85% of the nasal passage is the maxilla.

Bimler Elite

Dr. J. W Truitt | Jane Doe | Female | 10 yrs 8 mos | 7/2/2004



Class II

25.4

13

ANTERIOR CRANIAL BASE
- Factor 7 Size: 70.8mm
- Factor 7 Angle: 7.7°

SKELETAL CLASS OF MANDIBLE

Profile Angle	25.4°	Class II
A-B Distance	[illegible]	Class II
Position of Mandible T-TM	[illegible]	Medium. Average position.
Normalized T-TM	3.0	
Size of Mandible (DLM)	103.1mm	
Normalized DLM	10.2	
Correlation Classification	3.4mm	Post Apicale (Class II)
B Point to A-Arc	6.2mm	Class II
Pogonion to ANT-Arc	5.2mm	Class II
MC to BNV	8.7mm	Class II

SKELETAL DIVISION OF MAXILLA

Position of Maxilla:		
Factor 1	3.0°	Division I.
ANS to Anterior Arc	Forward:	Division I.
Size of Maxilla:		
Actual A-T	51.3mm	
Normalized A-T	5.1	Division I.
Dental Divison		
Upper Incisal Angle:	115.6°	Division I.
Lower Incisal Angle:	125°	

SKELETAL VERTICAL DETERMINANTS

Maxillary Plane (Factor 4):	-6.7°	Negative (divergent). Open bite.
Alveolar Height:	3.2mm	Tendency to open.
Upper/Lower Facial Volume:	D / L	Excess lower volume. Open bite.
Suborbital Facial Index:	Meso	Neutral. No effect on vertical.
Summary of Vertical:		Open bite.

PREDOMINANT DIRECTION OF GROWTH
- Neutral Grower. Meso

ADENOIDAL TISSUE IMPINGEMENT
- ATI measurement: 4.2mm Constricted

FEMALE FACIAL AESETHETICS
- Position of Upper Lip Relative to BNV: 0.8mm Normal
- Upper Lip Angle: 31.0°
- Factor 10: 27.6°

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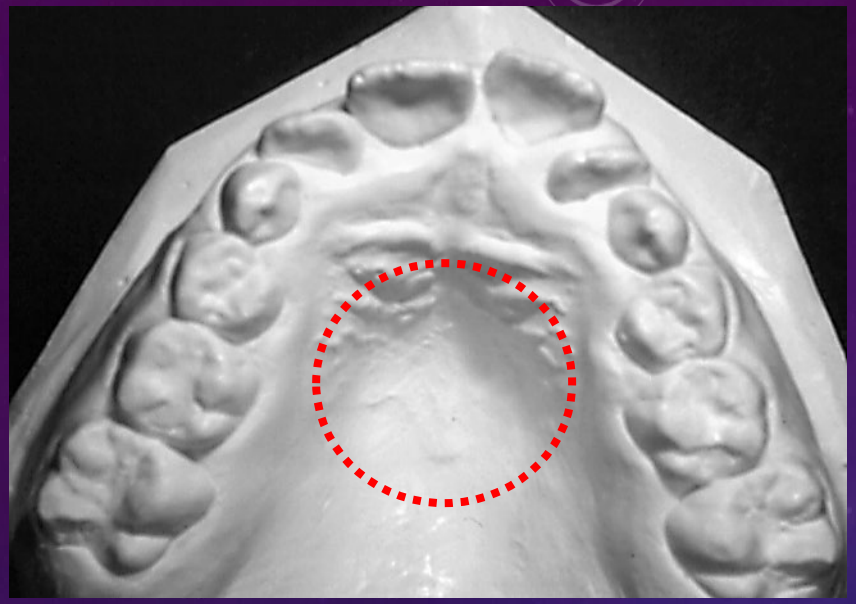

Before

Before

Maxillary Schwarz Appliance

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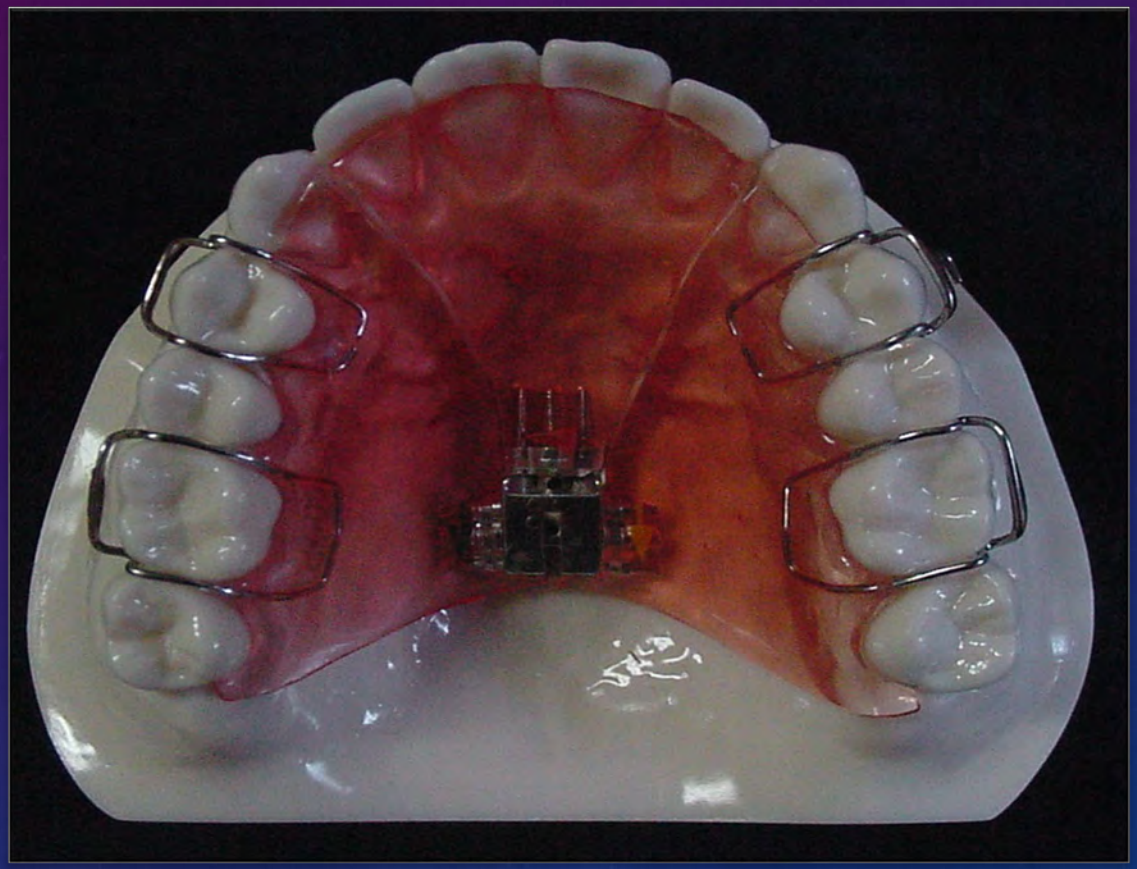
3-Directional Schwarz



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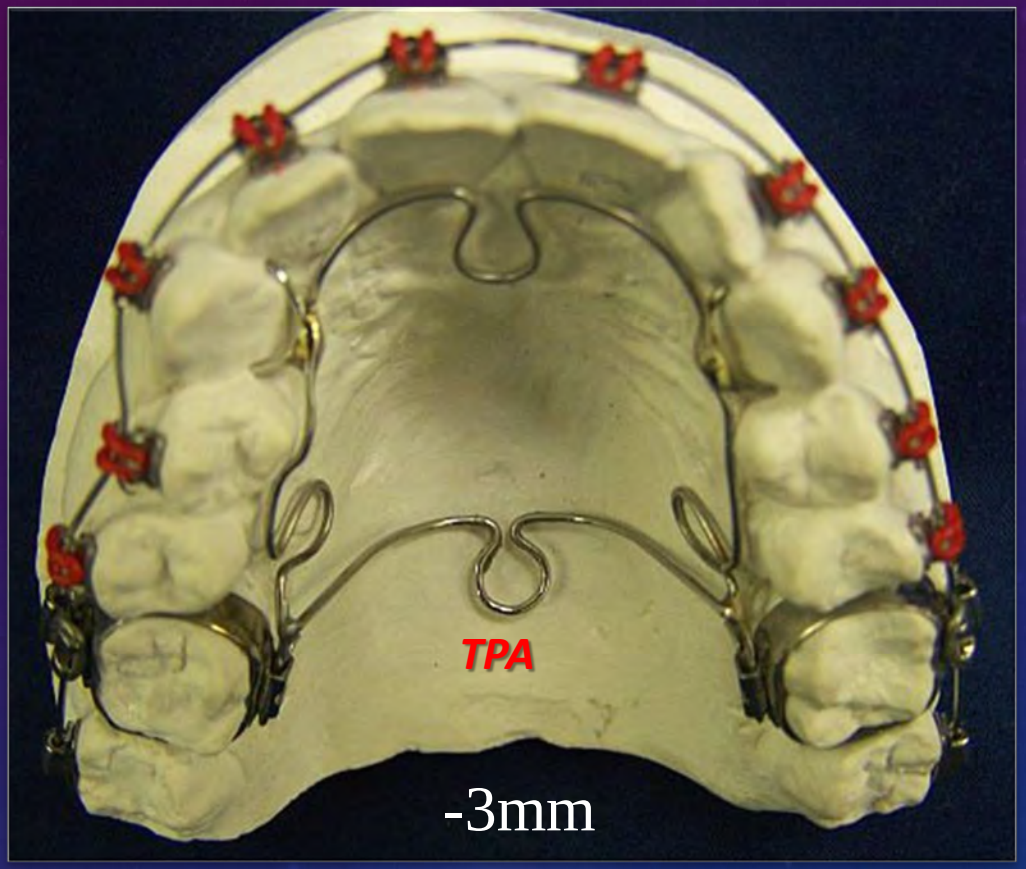

Upper ALF & Delta Force

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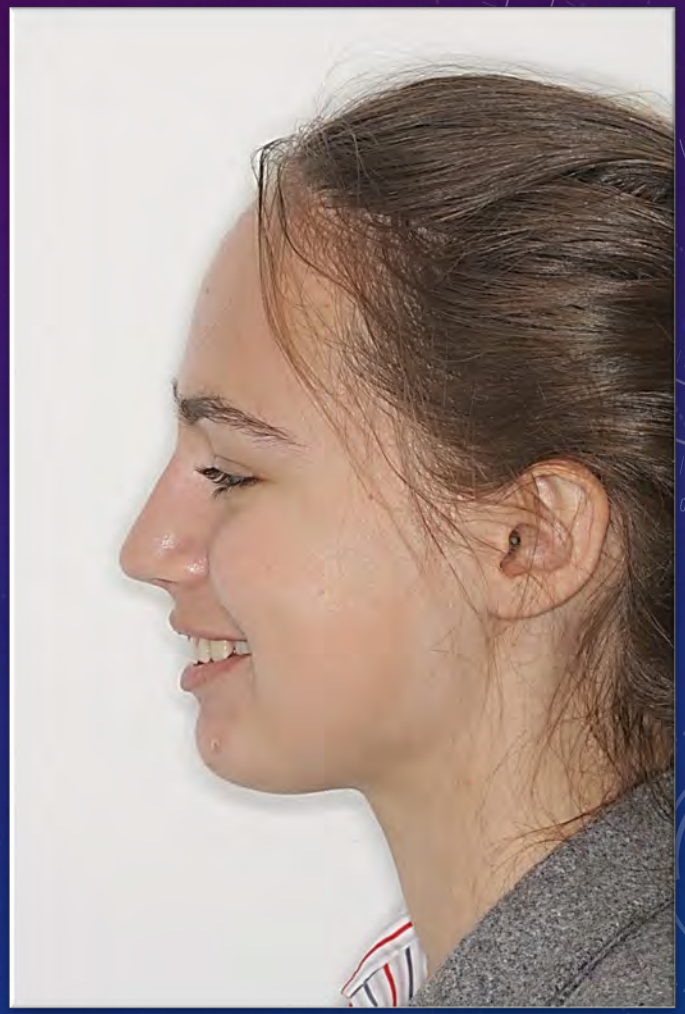
AIR WAY OBSTRUCTION

The Skeletal Class II

Skeletal Class II

Before

Skeletal Class I



After

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Grade #3

Grade #4

Lingual Tonsils

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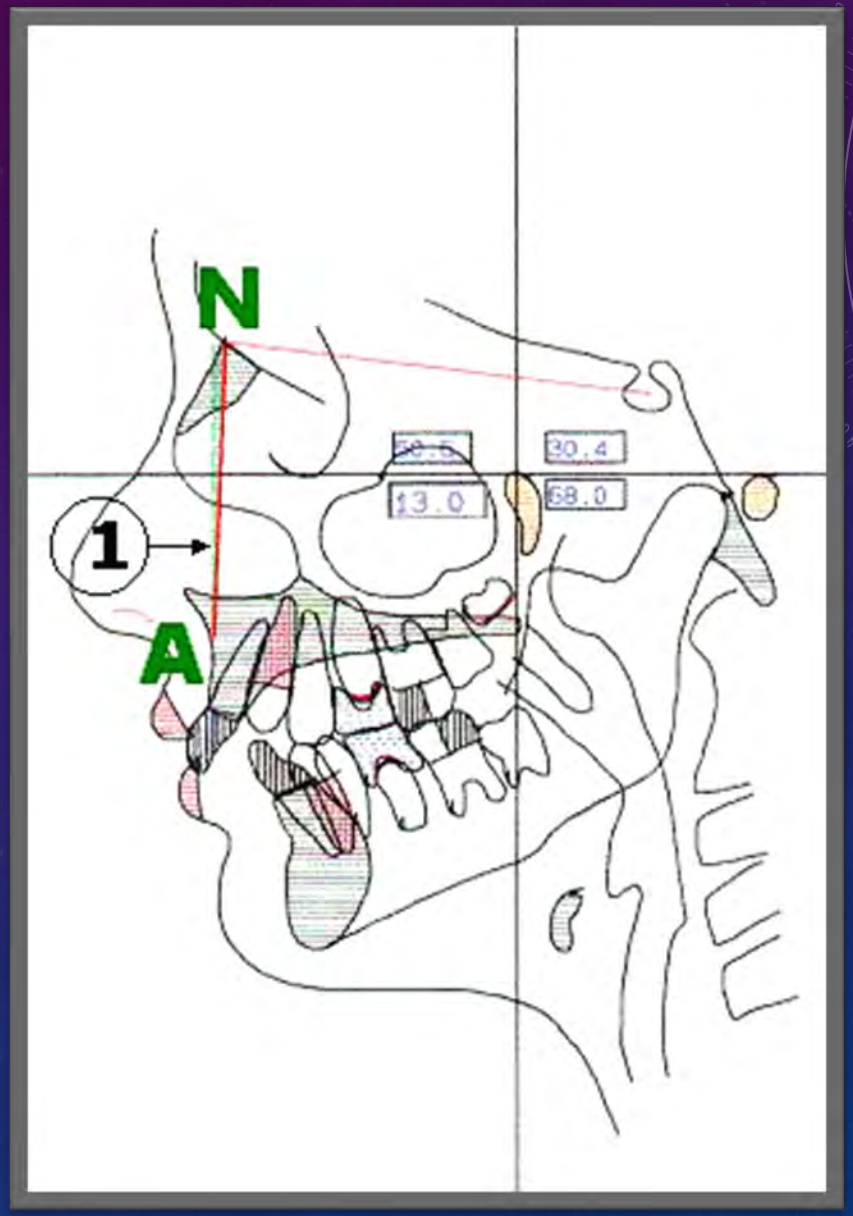
AIR WAY OBSTRUCTION

The position of the Maxilla
(Factor #1)

FACTOR 1

Relationship of Maxilla (A) to Anterior Cranial Base (N)



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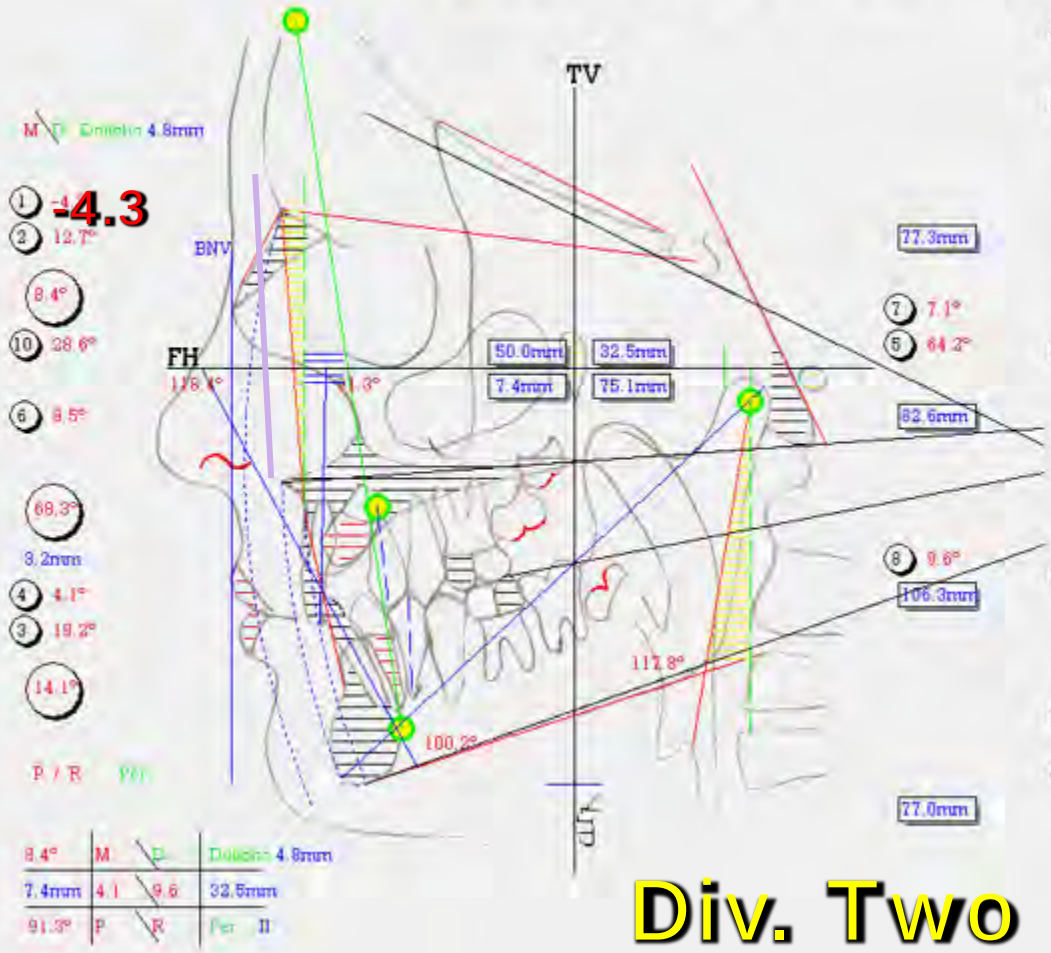
Bimler Elite

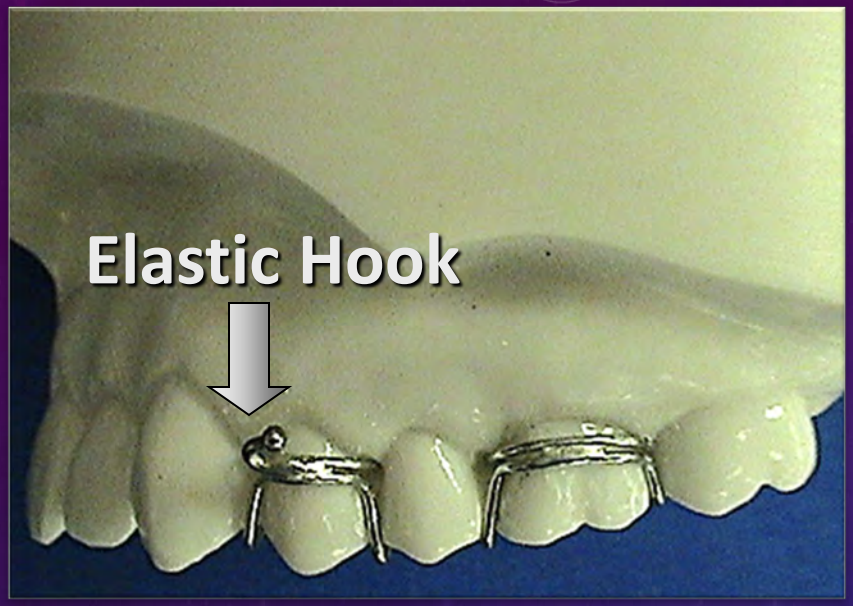
Dr. M. D. Skip Truitt | Male | 11 yrs 4 mos | 3/29/2006



ANTERIOR CRANIAL BASE		
Factor 7 Size	77.3mm	
Factor 7 Angle	7.1°	
SKELETAL CLASS OF MANDIBLE		
Profile Angle	8.4°	Class I
A-B Distance	7.4mm	approaching Class II
Position of Mandible T-TM	32.5mm	Long. Possible Class II
Normalized T-TM	2.9	
Size of Mandible (DLM)	106.3mm	
Normalized DLM	9.6	
Correlation Classification	1.6mm	Per Apinoso Classes
B Point to A-Arc	2.0mm	Class I
Pogonion to ANS-Arc	-0.1mm	Class I
MC to BNV	8.5mm	Class II
SKELETAL DIVISION OF MAXILLA		
Position of Maxilla:		
Factor 1	-4.3	Division II
ANS to Anterior Arc	Behind	Division II
Size of Maxilla:		
Actual A-T	50.0mm	
Normalized A-T	4.5	Division II
Dental Divison		
Upper Incisal Angle:	91.3°	Division II
Lower Incisal Angle:	118.4°	
SKELETAL VERTICAL DETERMINANTS		
Maxillary Plane (Factor 4):	4.1°	Positive (convergent). Tendency to close.
Alveolar Height:	3.2mm	Tendency to open.
Upper/Lower Facial Volume:	M / D	Excess upper volume. Tendency to close.
Suborbital Facial Index:	Dolichio 4.8mm	Deep face. Close bite.
Summary of Vertical:		Close bite.
PREDOMINANT DIRECTION OF GROWTH		
Horizontal Grower.	Dolichio 4.8mm	
ADENOIDAL TISSUE IMPINGEMENT		
ATI measurement:		
10.0mm	Normal	

8.4°	M	D	Dolichio 4.8mm
7.4mm	4.1	9.6	32.5mm
91.3°	P	R	Per II

Div. Two



R-N Sagittal

R.P.H.G.

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Maxillary Protraction Appliance Effect on the Size of the Upper Airway Passage

Husamettin Oktay & Esengul Ulukaya

The Angle Orthodontist:
Vol. 78, No 2, pp. 209-214, April 2007

Conclusion: The size of the upper airway can be increased by means of M.P.A. application.

Day R.P.H.G. (pedo)

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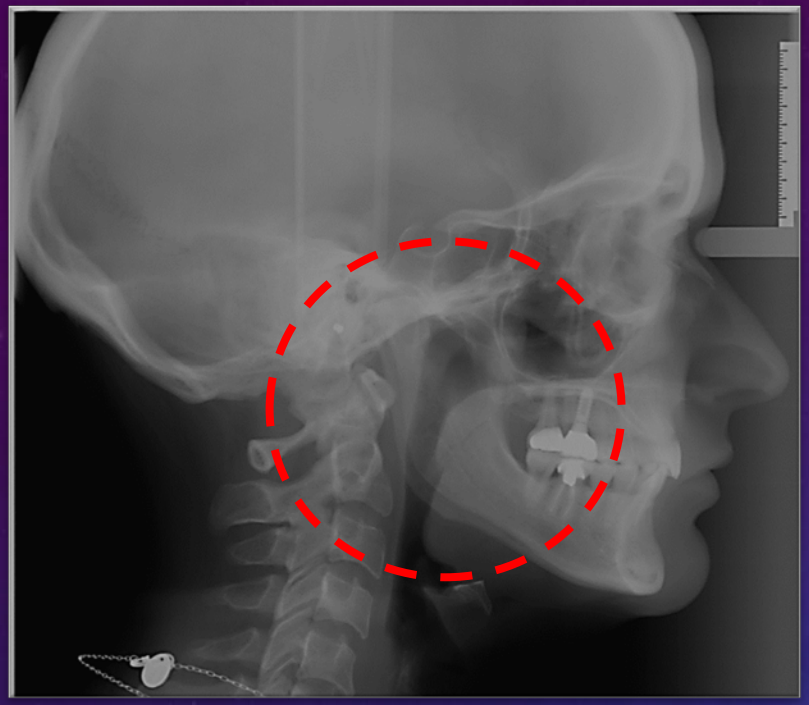
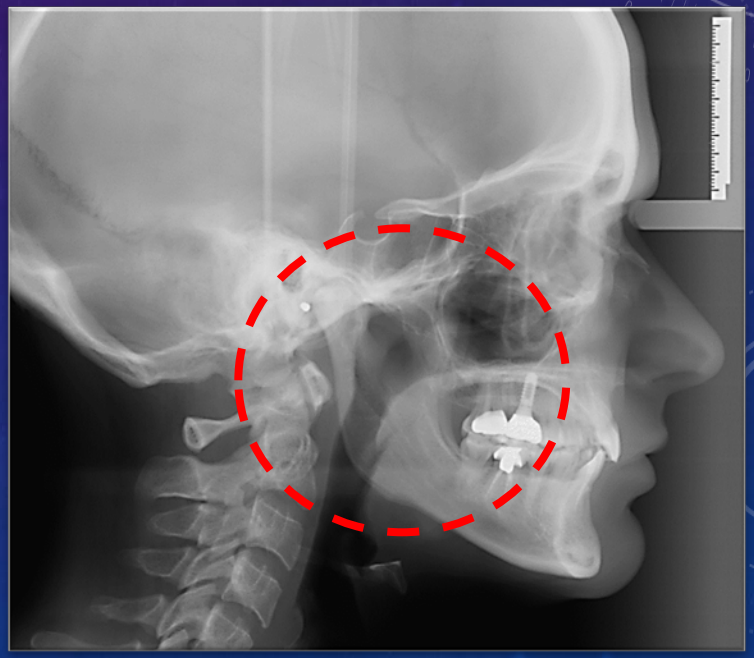


PMA Appliance



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Reverse Pull Headgear

(Orthopedic Function)

* To advance the position of the Maxilla *(Factor #1)*

* 8oz per side followed by 16oz

* Elastics attach to the front of the maxilla (Kline Effect)

* Night time wearing is sufficient to clear the airway.

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*Head posture forward and up.

*Passive mouth breathing.

*Venous pooling beneath the orbits.

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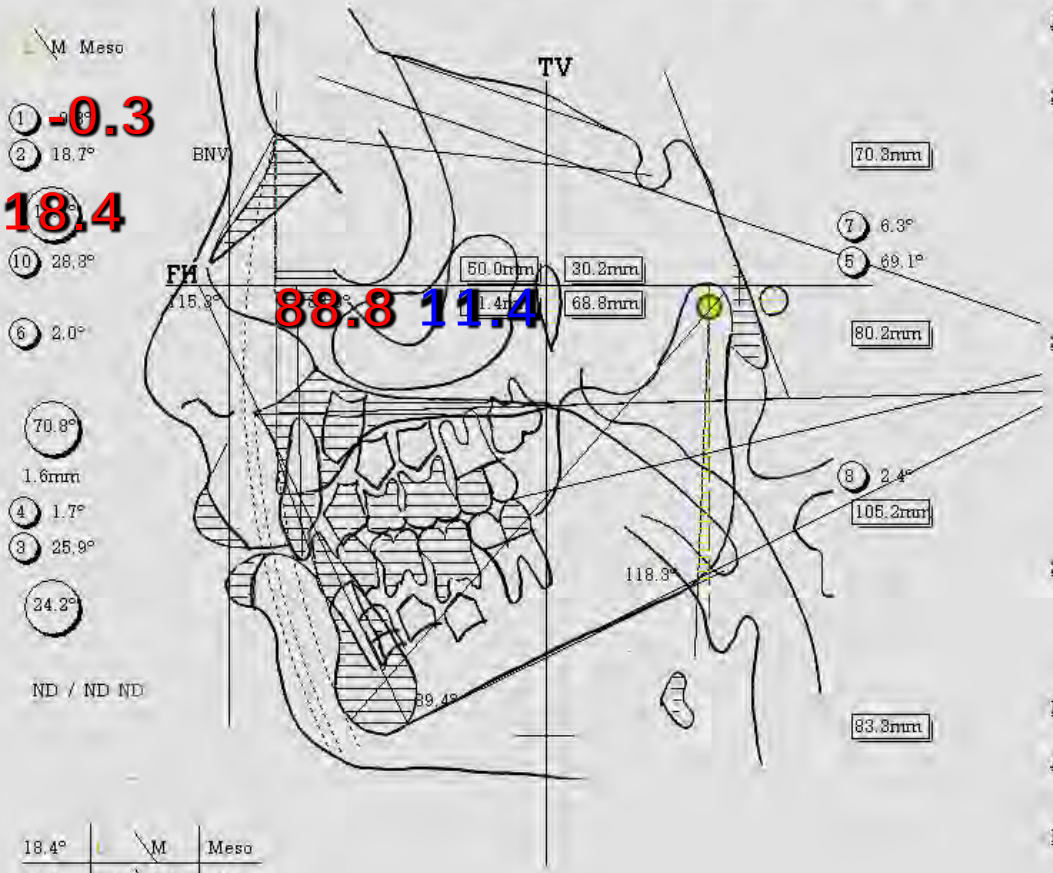
Bimler Elite

Dr. Skip Truitt | **C. W.** | **Male** | **07 yrs 4 mos** | **2/26/2006**



18.4°	L	M	Meso
11.4mm	1.7	2.4	30.2mm
88.8°	ND	ND	ND II

ANTERIOR CRANIAL BASE

Factor 7 Size	70.3mm	
Factor 7 Angle	6.3°	

SKELETAL CLASS OF MANDIBLE 18.4 / 11.4 / 3.0 / 10.5

Profile Angle	[illegible]	Class II
A-B Distance	[illegible]	Class II
Position of Mandible T-TM	[illegible]	Medium. Average position.
Normalized T-TM	[illegible]	
Size of Mandible (DLM)	[illegible]	
Normalized DLM	[illegible]	
Correlation Classification	[illegible]	Non-Diagnostic. Invalid curve of Spee.
B Point to A-Arc	[illegible]	Class II
Pogonion to ANS-Arc	3.4mm	Class II
MC to BNV	8.5mm	Class II

SKELETAL DIVISION OF MAXILLA -0.3 / 5.0 / 88.8

Position of Maxilla:		
Factor 1	[illegible]	Division II.
ANS to Anterior Arc	[illegible]	Division II.
Size of Maxilla:		
Actual A-T	[illegible]	
Normalized A-T	[illegible]	Division I.
Dental Divison		
Upper Incisal Angle:	[illegible]	Division II.
Lower Incisal Angle:	[illegible]	

SKELETAL VERTICAL DETERMINANTS

Maxillary Plane (Factor 4):	1.7°	Positive (convergent). Tendency to close.
Alveolar Height:	1.6mm	Tendency to open.
Upper/Lower Facial Volume:	[illegible] / M	Excess upper volume. Tendency to close.
Suborbital Facial Index:	Meso	Neutral. No effect on vertical.
Summary of Vertical:		Tendency to close.

PREDOMINANT DIRECTION OF GROWTH

Neutral Grower. Meso

ADENOIDAL TISSUE IMPINGEMENT

ATI measurement: 1.9mm 1.9 Constricted

FEMALE FACIAL AESETHETICS

Position of Upper Lip Relative to BNV: 1.6mm Normal

Upper Lip Angle: 27.9°

Factor 10: 28.3°

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Schwarz Appliances

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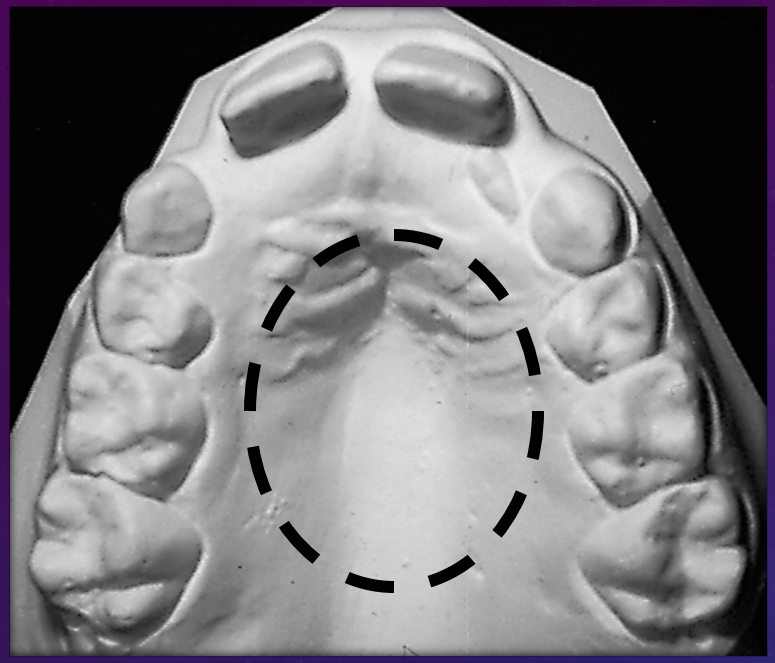
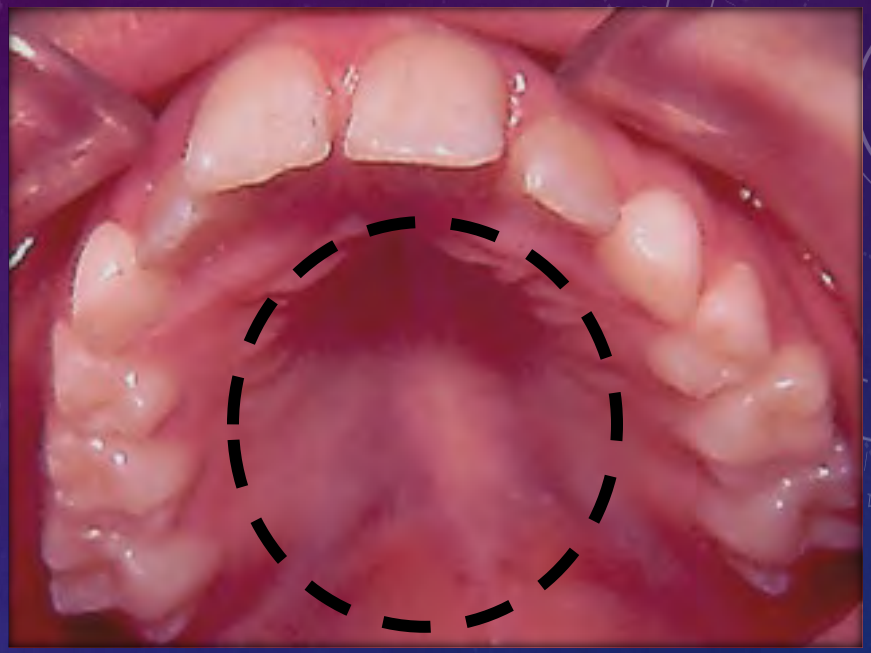
Maxilla Modeling





*Nasal passage blocked vertically

&

constricted transversely.

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Bionator to open

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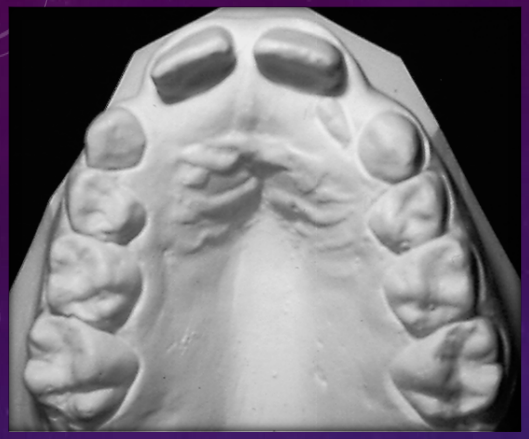

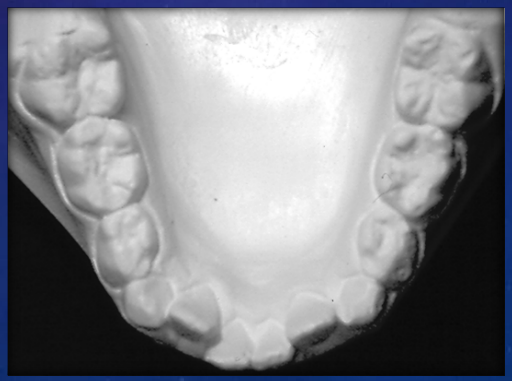

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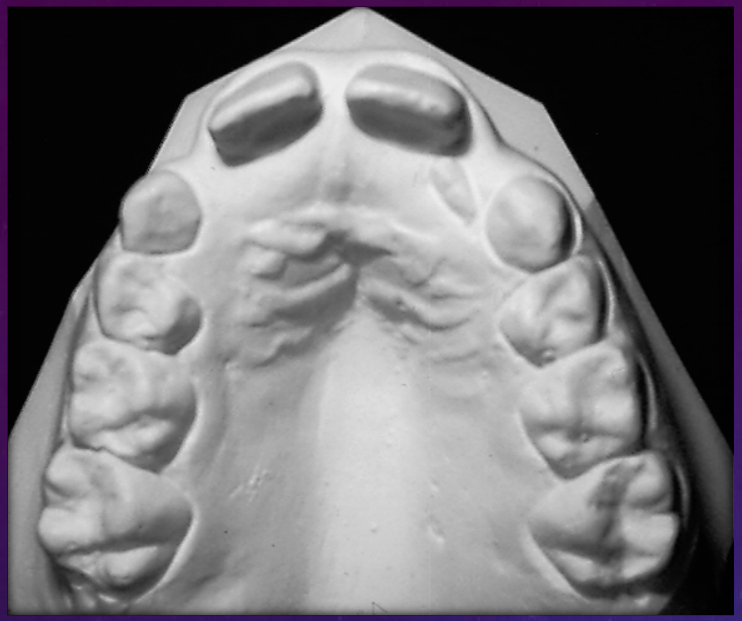

Maxilla Modeling

Dental Remodeling

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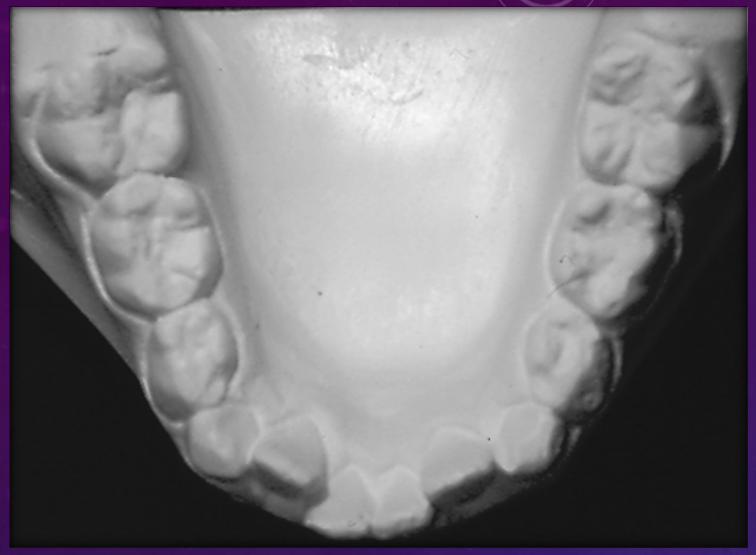

Alveolar Process Modeling

Dental Remodeling

Age 7

Age 14

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Tongue Function

ANTERIOR THRUST

Facial Nerve

Vs

LATERAL THRUST

Trigeminal Nerve

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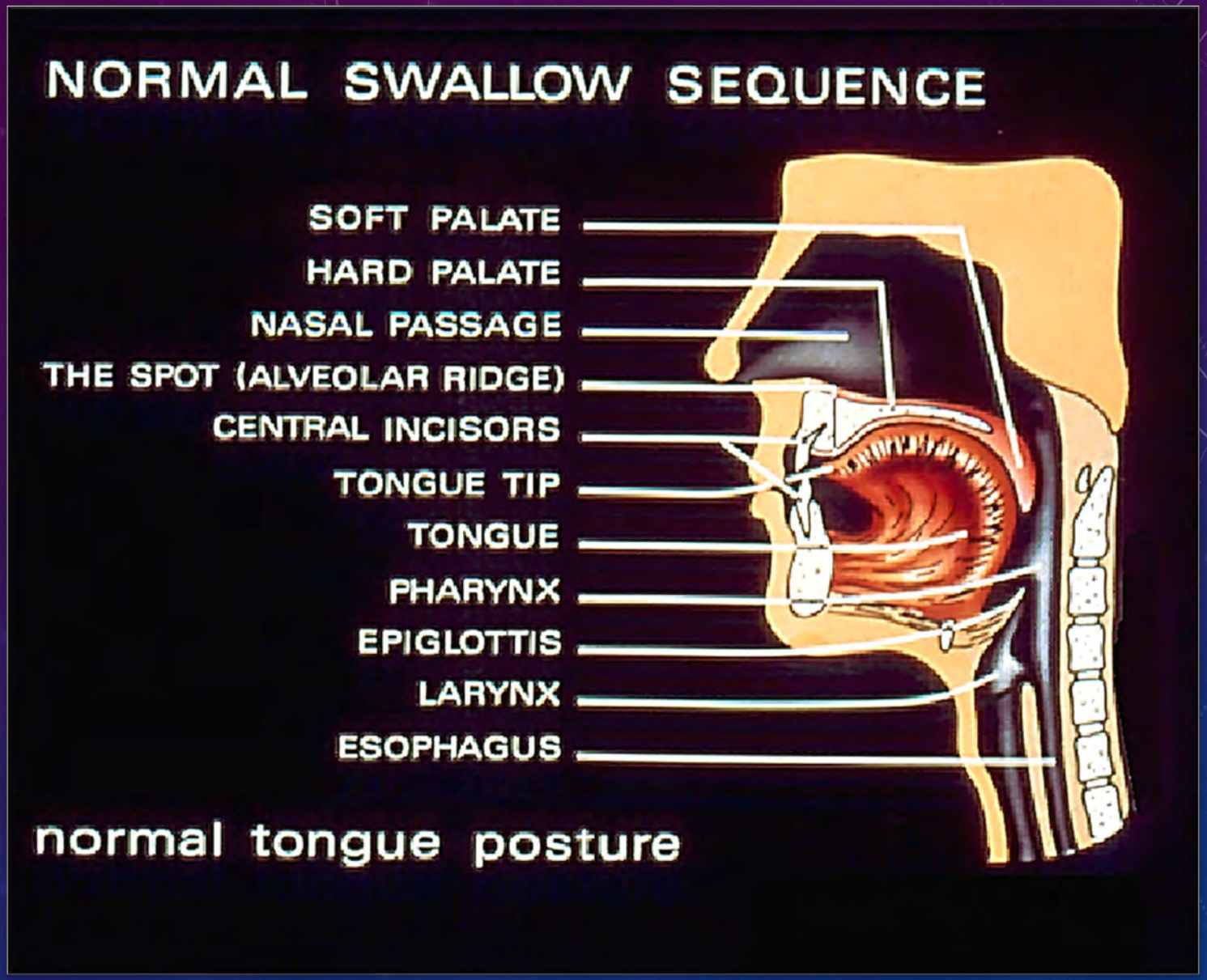

Trigeminal Nerve

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Test for anterior tongue thrust

* Patient is upright
* Separate lips
* Place water in mouth
* Observe swallowing pattern

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Lateral Tongue Thrust

Trigeminal Nerve

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Test for lateral tongue thrust

* Patient is upright
* Separate lips
* Place water in mouth
* Observe swallowing pattern

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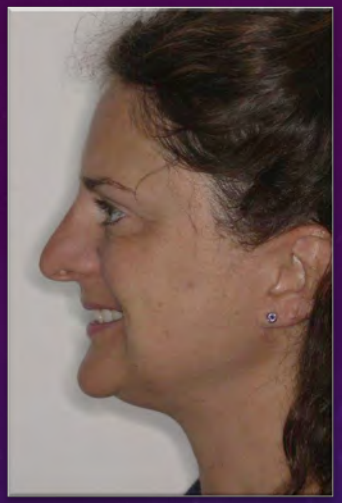

Tongue Splinting
T.M.D.

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*Head posture forward and up.

*Passive mouth breathing.

*History of tubes in the ears.

*Venous pooling.

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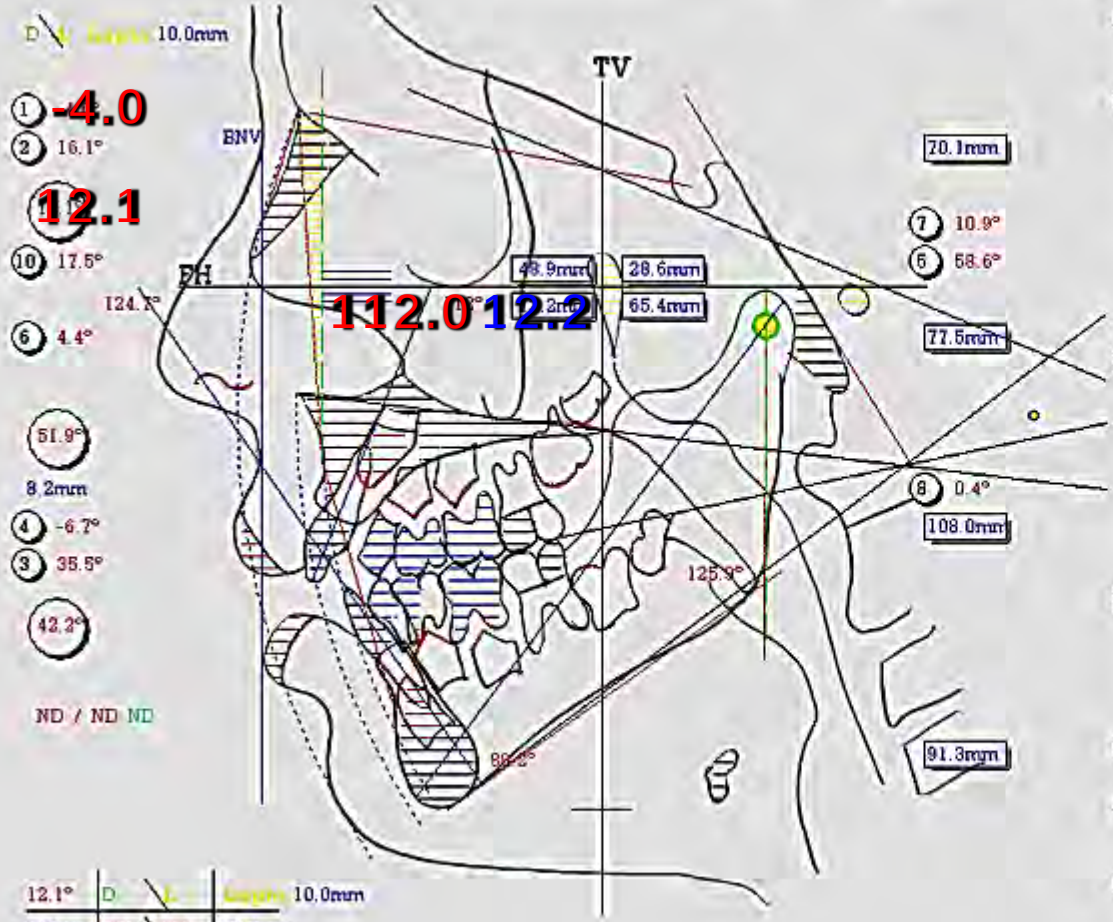
Bimler Elite

Dr. J.W.Truitt B.F. Male 9 yrs 9/13/2005



12.1°	D / L	Length 10.0mm
12.2mm	-6.7 / 0.4	28.6mm
112°	ND / ND	ND II

ANTERIOR CRANIAL BASE

Factor 7 Size	70.1mm	
Factor 7 Angle	10.9°	

SKELETAL CLASS OF MANDIBLE

Profile Angle	12.1	approaching Class II
A-B Distance	12.2mm	Class II
Position of Mandible T-TM	12.2	Medium. Average position.
Normalized T-TM	2.9	
Size of Mandible (DLM)	108.0mm	
Normalized DLM	10.8	
Correlation Classification	49.5mm	Non-Diagnostic: Invalid curve of Spee
B Point to A-Arc	1.8mm	Class I
Pogonion to ANS-Arc	2.8mm	Class I
MC to BNV	12.2mm	Class II

SKELETAL DIVISION OF MAXILLA

Position of Maxilla:		
Factor 1	-4.0	Division II.
ANS to Anterior Arc	Behind:	Division II.
Size of Maxilla:		
Actual A-T	18.9mm	
Normalized A-T	4.9	Division II.
Dental Division		
Upper Incisal Angle:	112°	Division II.
Lower Incisal Angle:	112.0	

SKELETAL VERTICAL DETERMINANTS

Maxillary Plane (Factor 4):	-6.7°	Negative (divergent). Open bite.
Alveolar Height:	8.2mm	Open bite.
Upper/Lower Facial Volume:	D / L	Excess lower volume. Open bite.
Suborbital Facial Index:	Length 10.0mm	Long face. Open bite.
Summary of Vertical:		Open bite.

PREDOMINANT DIRECTION OF GROWTH

Vertical Grower. Length 10.0mm

ADENOIDAL TISSUE IMPINGEMENT

ATI measurement: 5.7 Constricted

FEMALE FACIAL APSETHETICS

Position of Upper Lip Relative to BNV: 0.0mm Normal

Upper Lip Angle:	27.9°
Factor 10:	17.5°

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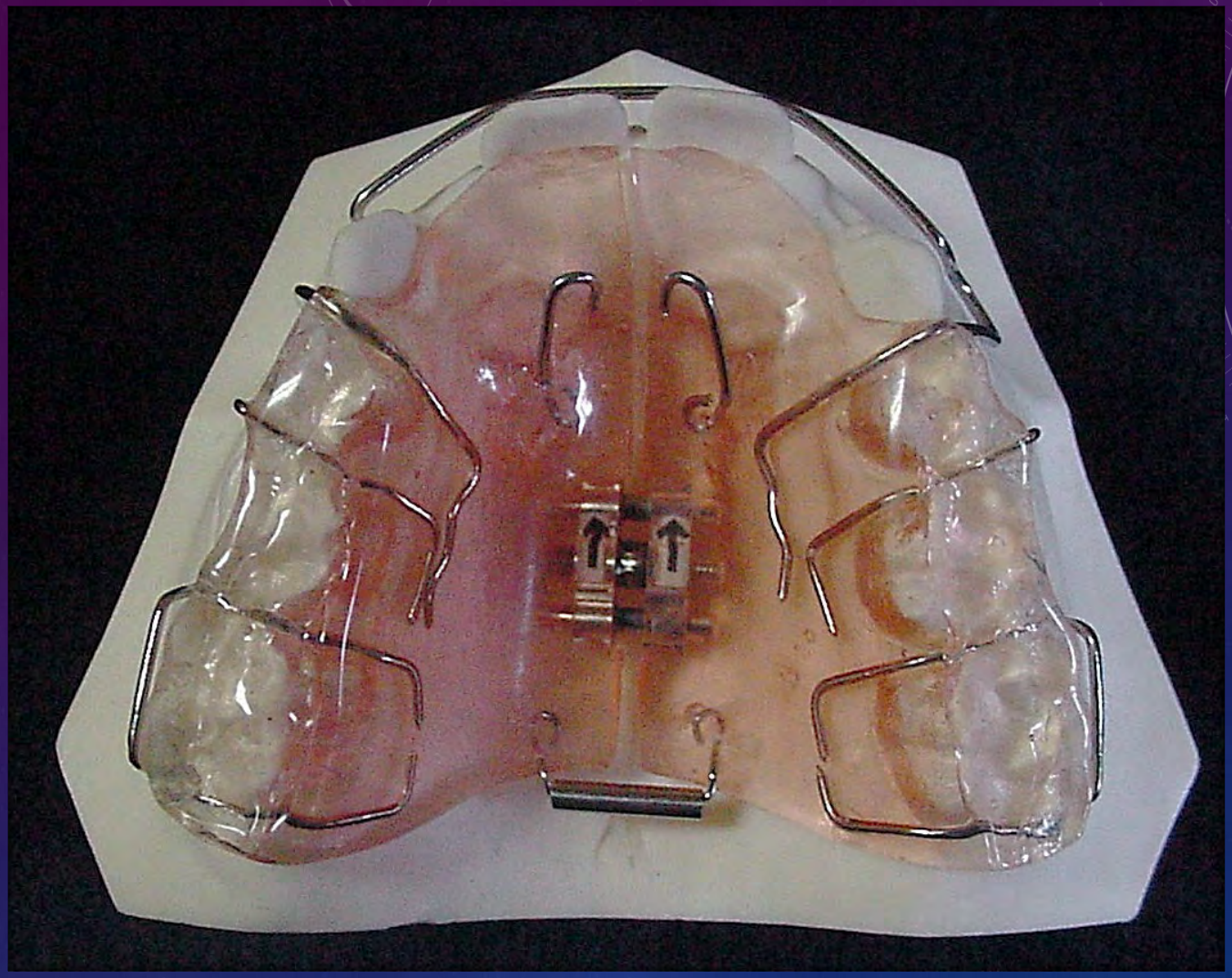

Modification for Tongue Thrust

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Age 8

Age 14

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Mouth Breathing

Normal Breathing

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Mouth Breathing

Normal Breathing

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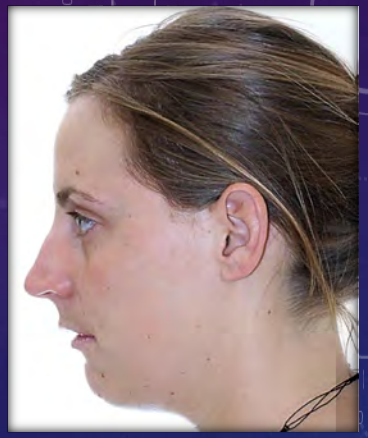
Aimee Jewel



*Female 25 years of age

*Anterior tongue thrust

*Obstructed airway

*Bilateral T.M.D. SR. Type II

*Chronic head & neck pain, vertigo & Tinnitus

*Diagnosed as Meniere's Disease

*Scheduled for four first bicuspid extraction & orthognathic surgery

How do you see this case???

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Medical / Dental Merry Go Round

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Aimee Jewel

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* Over-jet = 10mm
* Over-bite = -7mm

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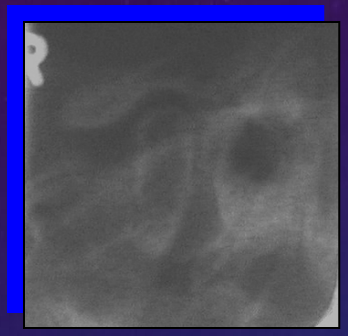
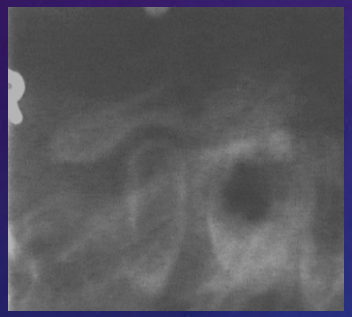
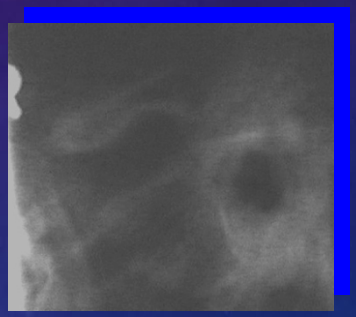


Closed



Rest



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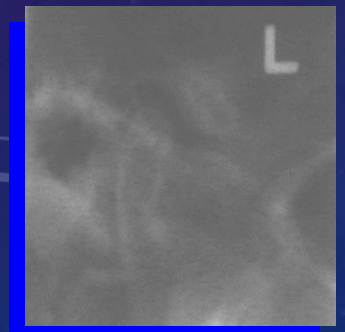

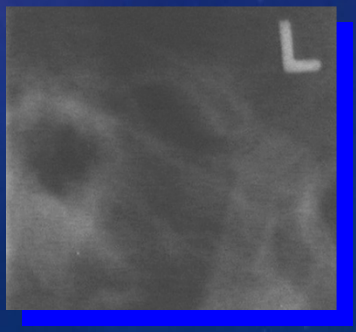

S R Type II

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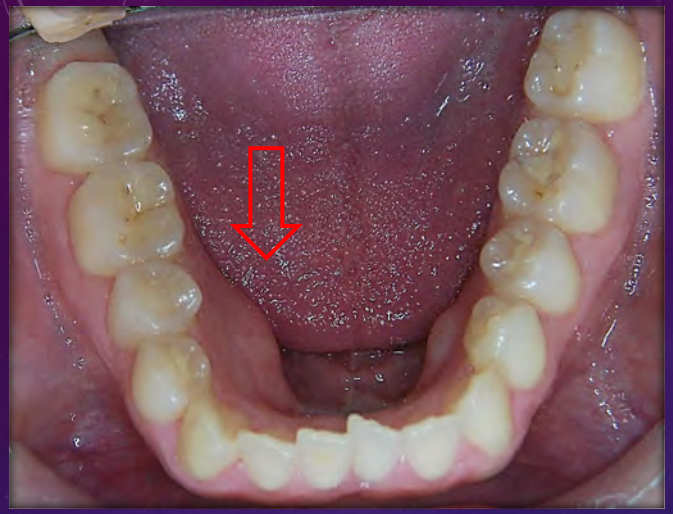
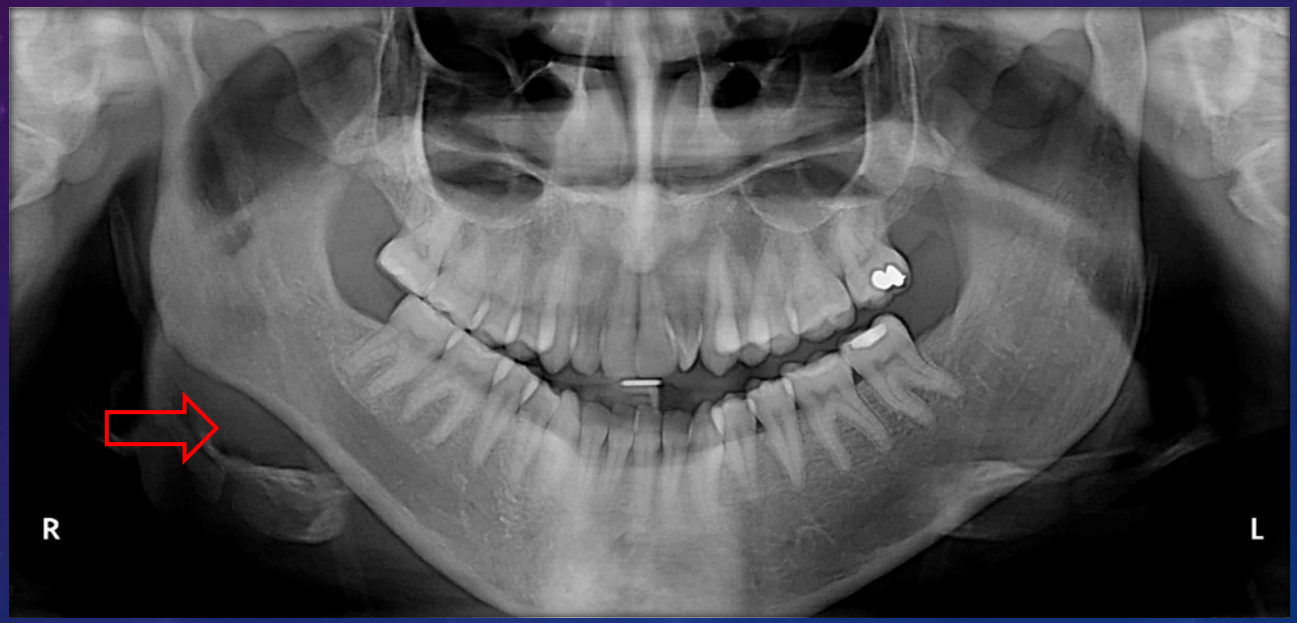
Lingual Tori
Mylohyoid





Gonial Notching
Superficial Masseter

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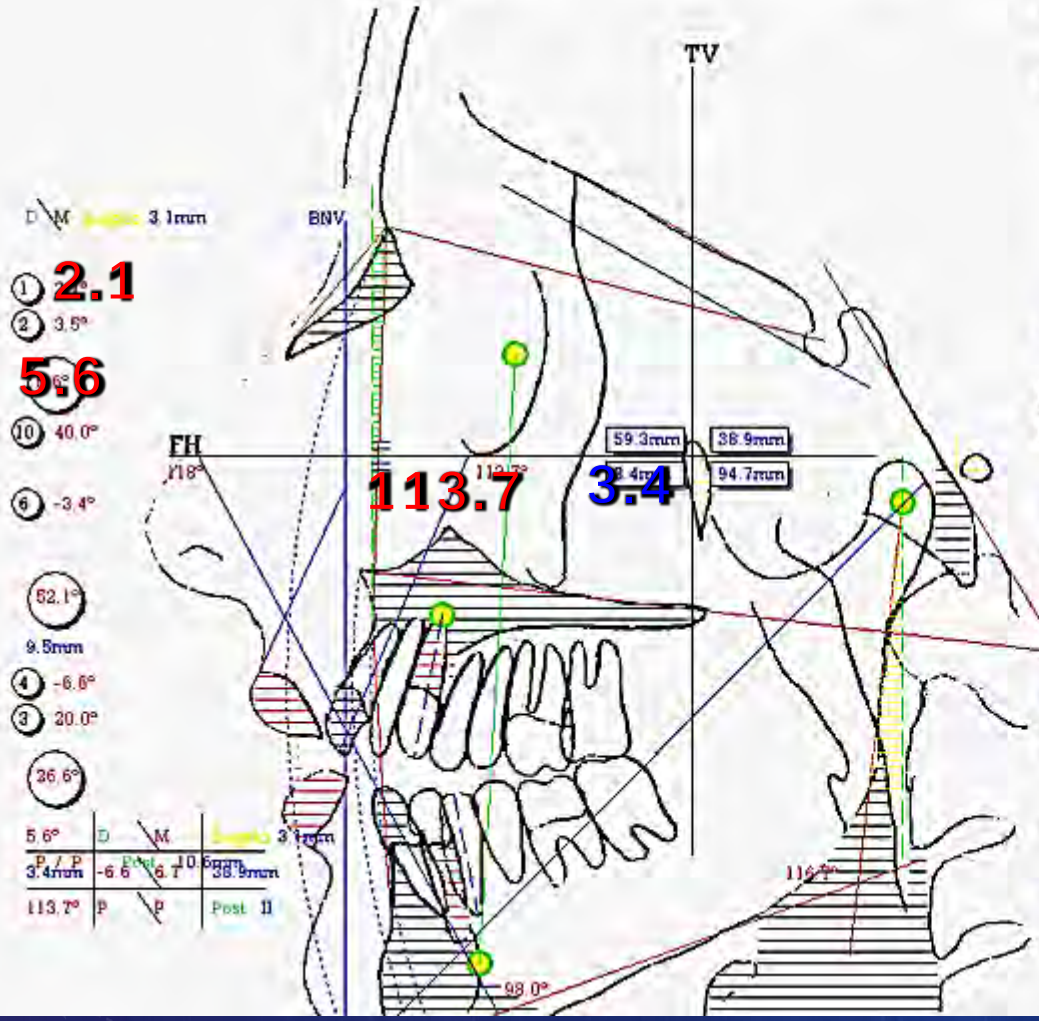
Bimler Elite

Dr. Livier Carreon **Aimee Jewel** **Female** **25 yrs** **05/06/2007**



ANTERIOR CRANIAL BASE
- Factor 7 Size: 83.9mm
- Factor 7 Angle: 14.6°

SKELETAL CLASS OF MANDIBLE
- Profile Angle: Clase I
- A-B Distance: Clase I
- Position of Mandible T-TM: Distancia T_TM extralarga. Clase II.
- Normalized T-TM
- Size of Mandible (DLM)
- Normalized DLM
- Correlation Classification: Post Apicale (Clase II)
- B Point to A-Arc: Clase I
- Pogonion to ANT-Arc: Clase I
- MC to BNV: Clase I

SKELETAL DIVISION OF MAXILLA
- Position of Maxilla:
- Factor 1: Division I.
- ANS to Anterior Arc: Behind: Division II
- Size of Maxilla:
- Actual A-T: 59.3mm
- Normalized A-T: Division II.
- Dental Division
- Upper Incisal Angle:
- Lower Incisal Angle: Division I.

SKELETAL VERTICAL DETERMINANTS
- Maxillary Plane (Factor 4): -6.6° Negativo (divergente). Mordida abierta.
- Alveolar Height: 9.5mm Mordida abierta.
- Upper/Lower Facial Volume: D / M Egenx(3)eso de volumen inferior. Tendencia a abrir
- Suborbital Facial Index: 3.1mm Cara larga. Tendencia a abrir.
- Summary of Vertical: Mordida abierta.

PREDOMINANT DIRECTION OF GROWTH
- Crecimiento Vertical: 3.1mm

ADENOIDAL TISSUE IMPINGEMENT
- ATI measurement: Normal

FEMALE FACIAL AESTHETICS
- Position of Upper Lip Relative to BNV: 11.4mm Normal
- Upper Lip Angle: 25.2°
- Facial 10: 40.0°

5.6
3.4
3.2
11.8
2.1
4.9
113.7
15.0

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1/8’’ 4.5oz Elastics

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April 2008

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June 2007

April 2008

August 2008

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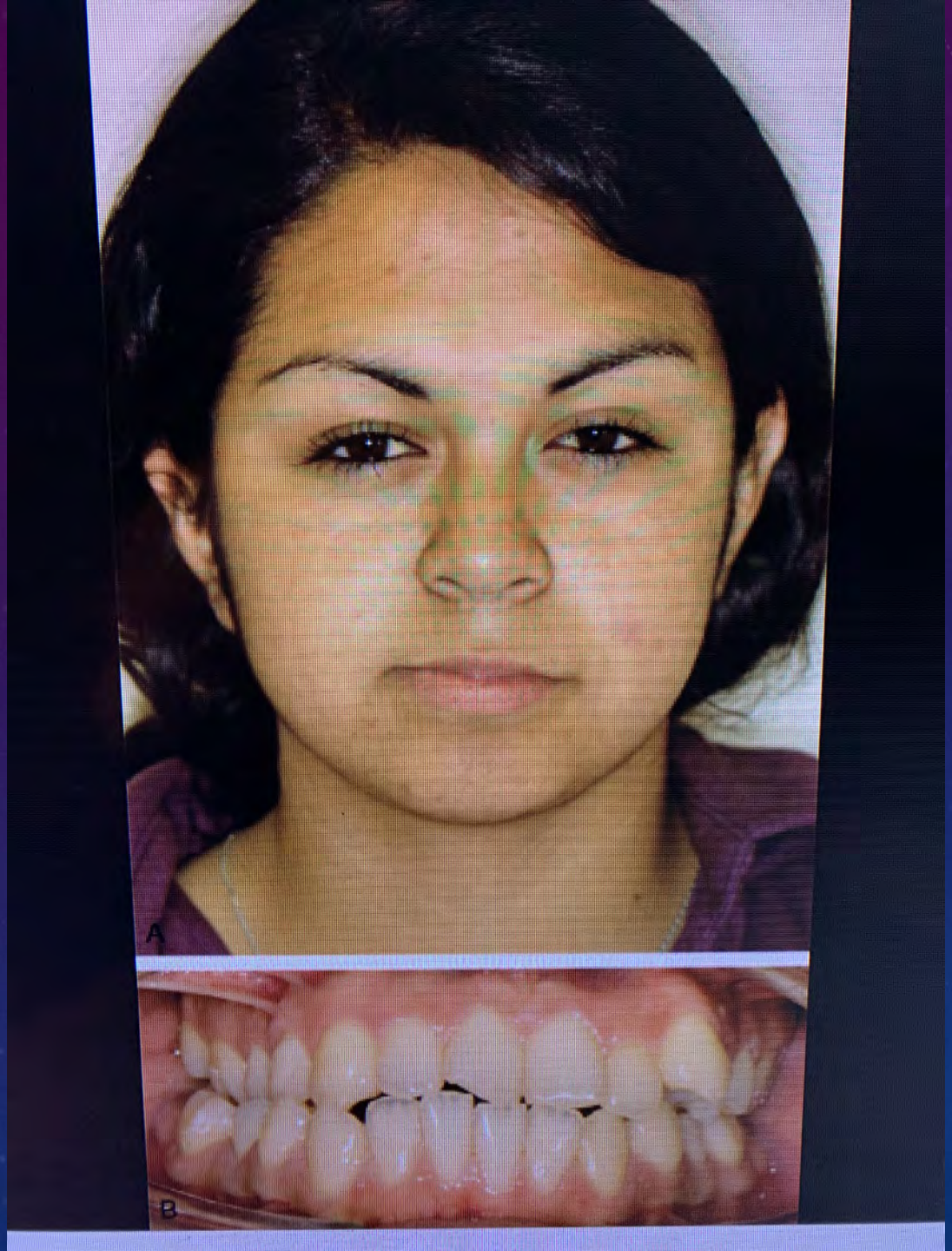

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Before

After

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