University "G. d'Annunzio" Chieti – Pescara
Department of Medical , Oral and Biotechnological Science
Director Prof. Camillo d'Arcangelo

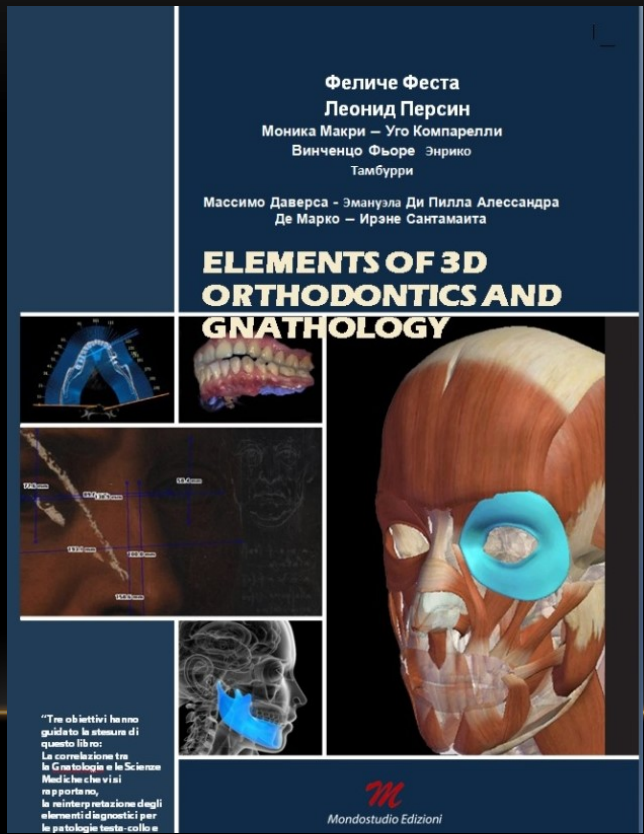
Orthodontics Specialty School
Director Prof. Felice Festa

DIAGNOSIS AND THERAPY: THE TRANSITION FROM 2D TO 3D.

F. FESTA, S. CAPUTI, M. MACRÌ

20 Orthodontic Congress of Russia in Sochi
23th May 2019

ORTHOGNATHIC ELEMENTS AND 3D GNATOLOGY



2D 3D TRANSITION

Diagnosis 3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

Treatment 2D Treatment/3D VTO/3D Clinchecks/ 3D Treatment/3D Upper Airway Reconstruction

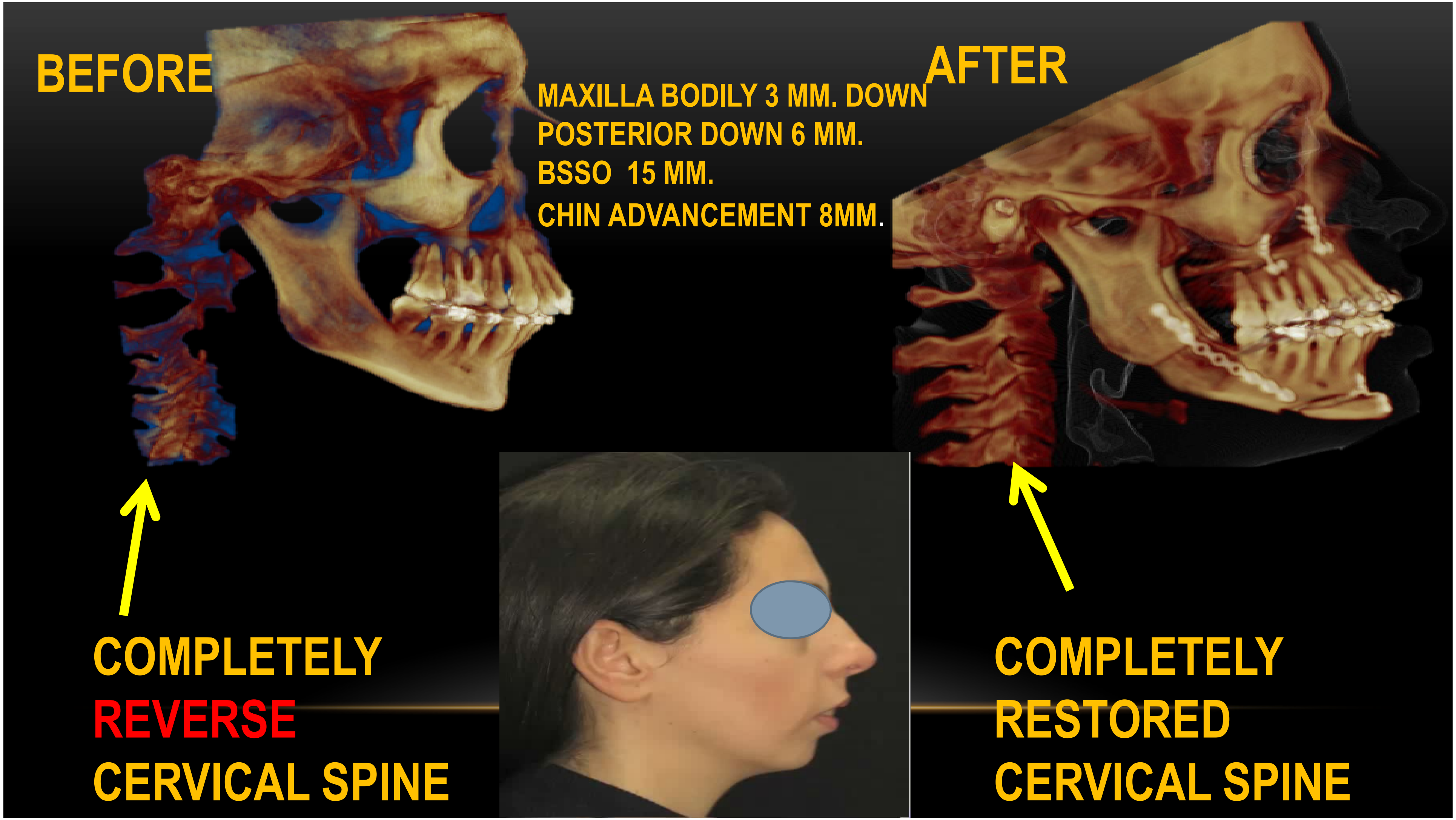
Appliances Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Surgical Splint/IDB V2

Case 27 TMJ Extratrarticular: TMJ Intra/Extraarticular Caucasian Class II, severe Symmetrical short mandible, Bilateral posterior maxilla contraction, Surgery First + Damon 3 + virtual Splint + Orthognatic Surgery

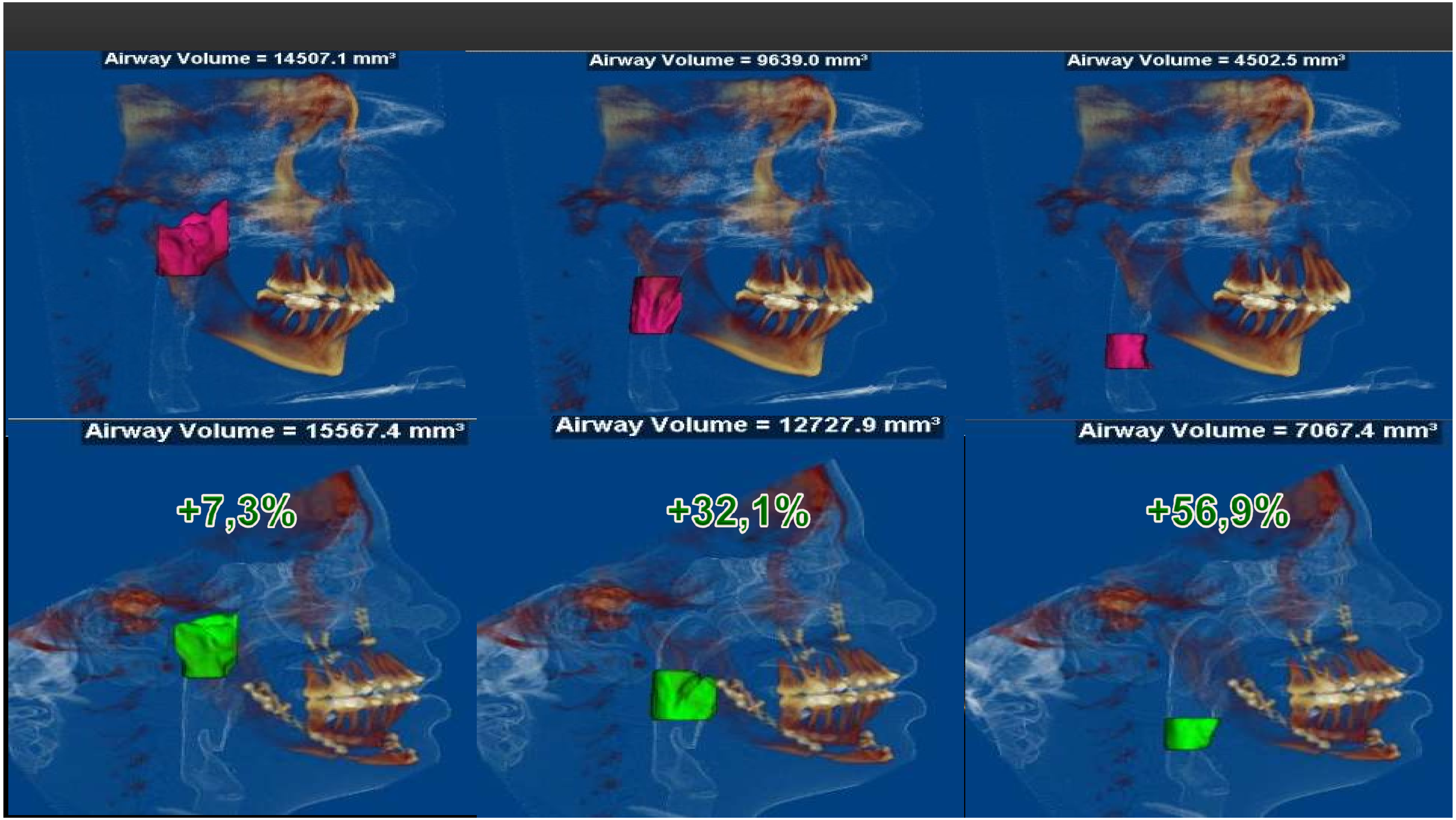
TMJ: Bilateral reciprocal late clicking Severe pain Temporalis Tendon L, Right Upper Trapezius

Age:33 years Surgery First + 6 Months SLLF to expand maxilla posteriorly 12 Months retention Passive Aligners+ Tongue /spine exercises


18/04/2011


BEFORE
MAXILLA BODILY 3 MM. DOWN
POSTERIOR DOWN 6 MM.
BSSO 15 MM.
CHIN ADVANCEMENT 8MM.
AFTER
COMPLETELY
REVERSE
CERVICAL SPINE
COMPLETELY
RESTORED
CERVICAL SPINE


17/12/2011

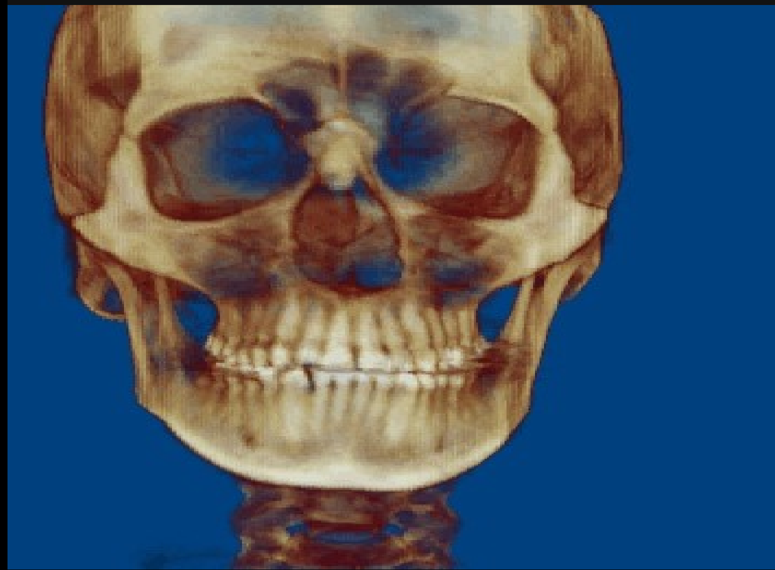

Airway Volume = 14507.1 mm³
Airway Volume = 9639.0 mm³
Airway Volume = 4502.5 mm³
Airway Volume = 15567.4 mm³
Airway Volume = 12727.9 mm³
Airway Volume = 7067.4 mm³
+7,3%
+32,1%
+56,9%

2D 3D TRANSITION

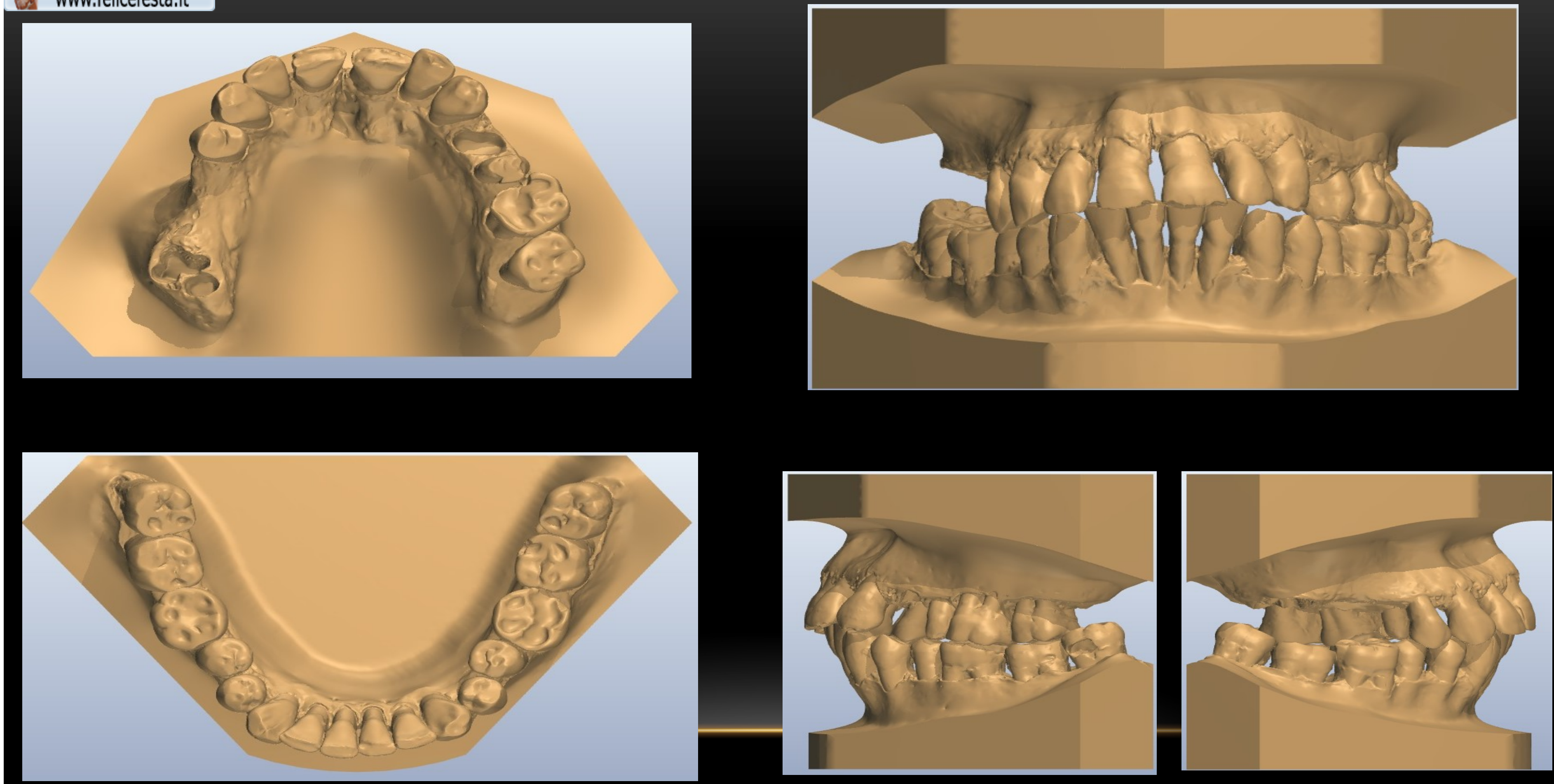
Diagnosis 3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

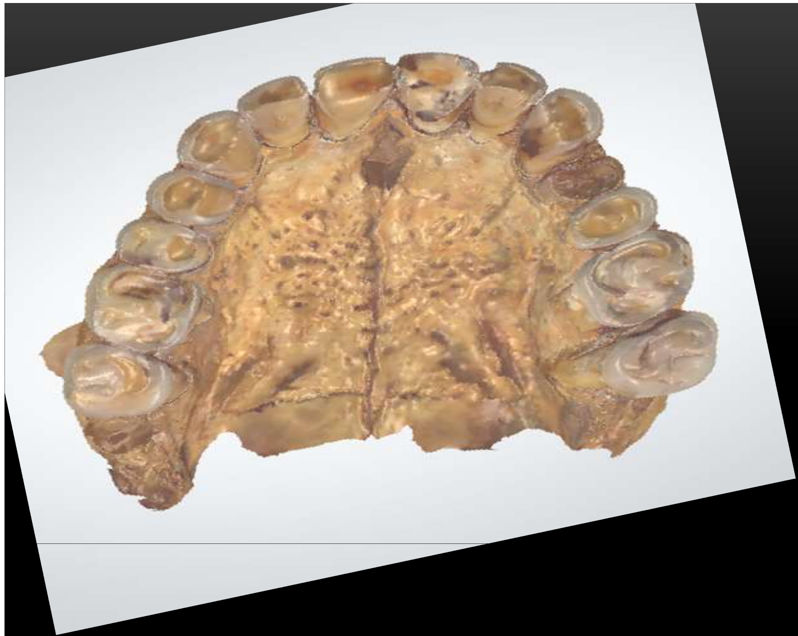
Treatment 2D Treatment/3D VTO/3D Clincheck/ 3D Treatment

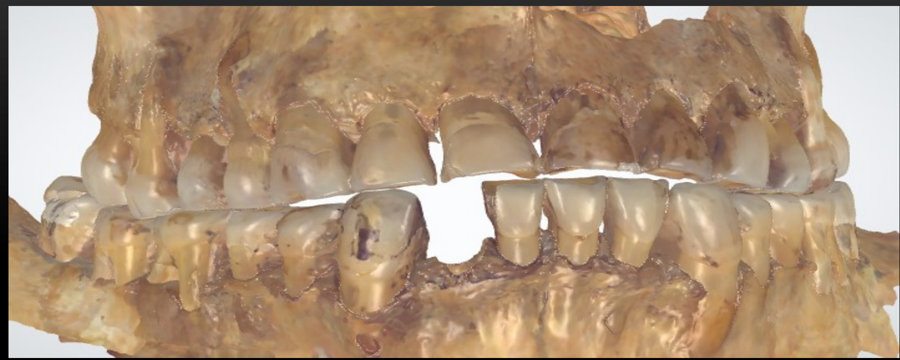
Appliances Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Surgical Splint/IDB V2

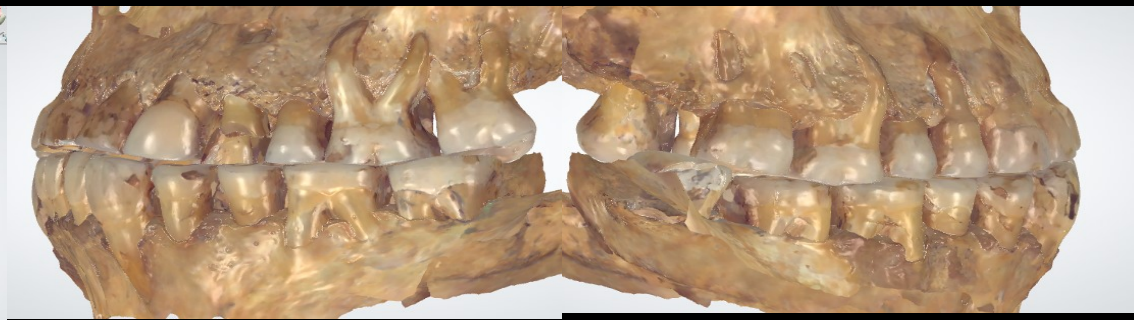


Comparison of skulls in the area with strong inbreeding. The distance between the skull of the living (right) and that of the probable ancestor is 4000 years



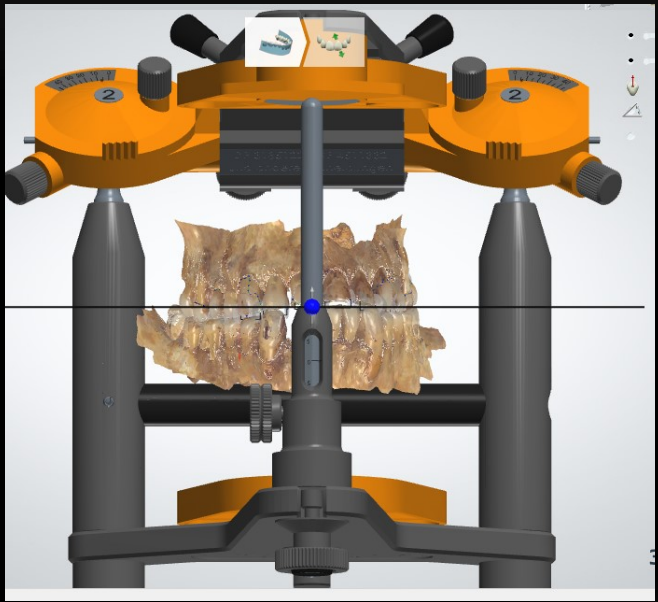


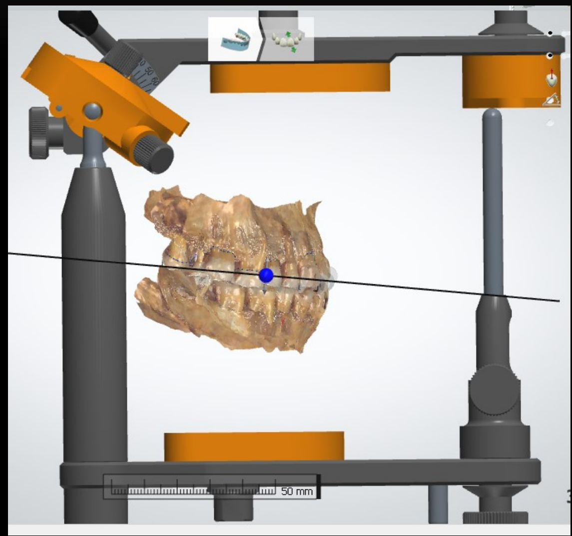




3D OPI ARCH RECONSTRUCTION

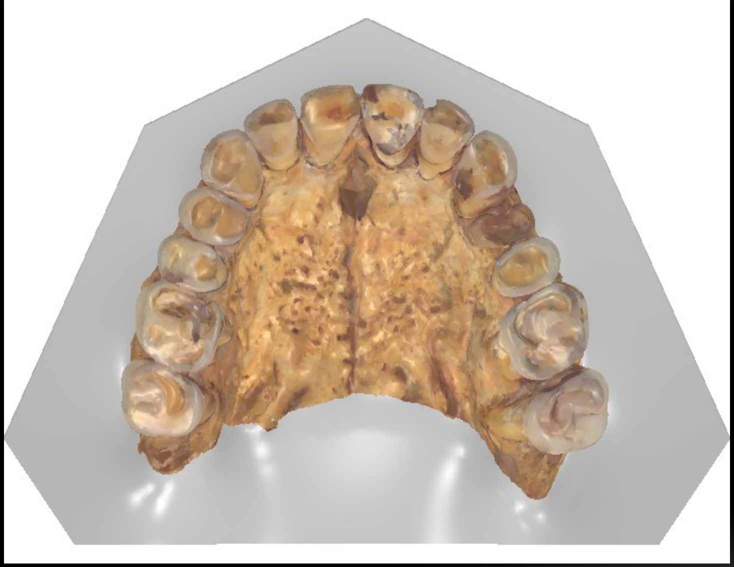
3D OPI ARCH VIRTUAL ARTICULATOR





OPI ARCH > CONTEMPORARY ARCH

Maxillary occlusal view

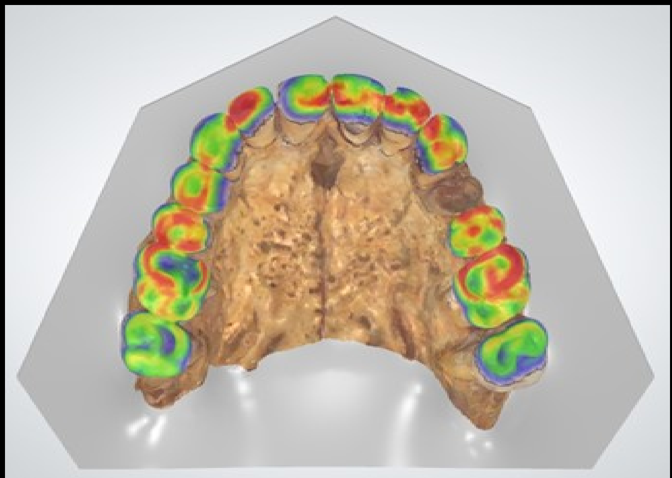


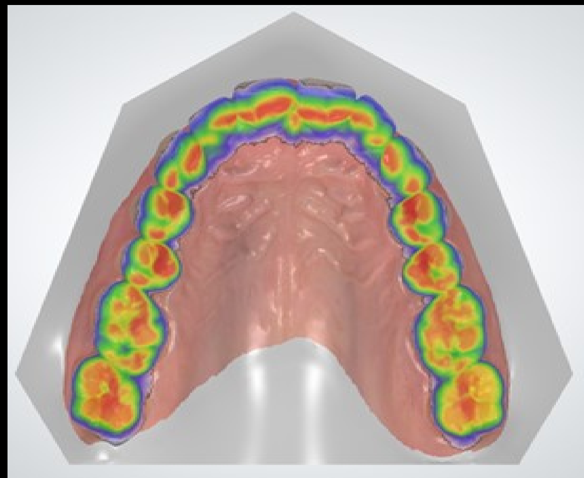
OPI ARCH > CONTEMPORARY ARCH

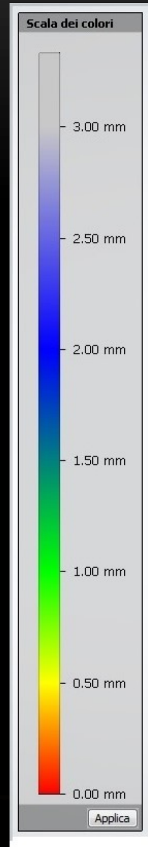
Mandibular occlusal view

OPI ARCH > CONTEMPORARY ARCH

Maxillary contacts

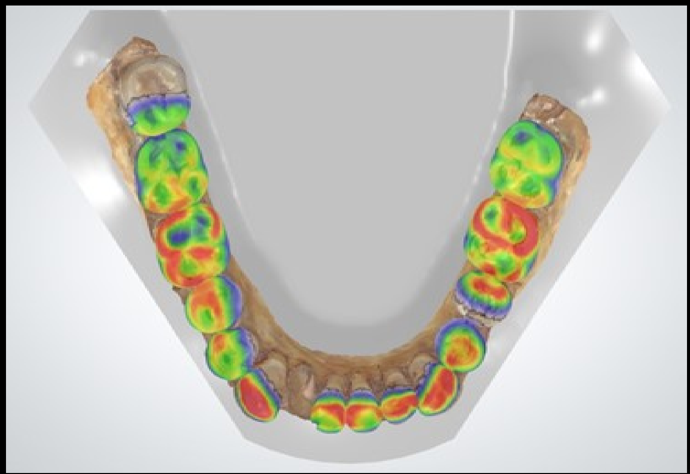


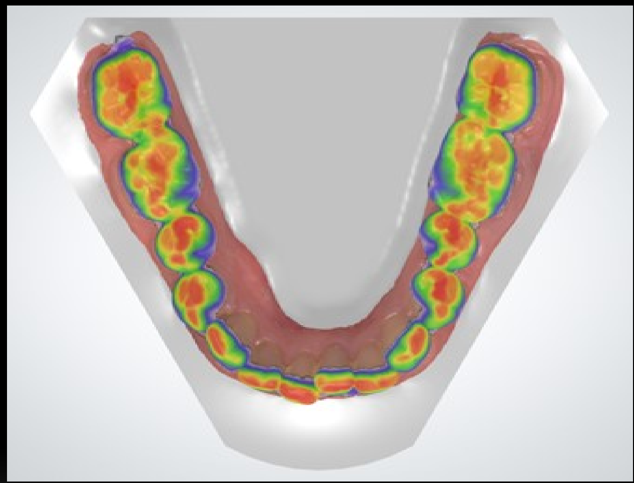


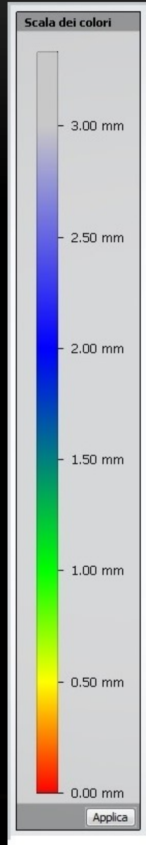


OPI ARCH > CONTEMPORARY ARCH

Mandibular contacts







IS IT POSSIBILE TO PREVENT DISTALIZATION/BONE LOSS COUNTEREFFECTS?

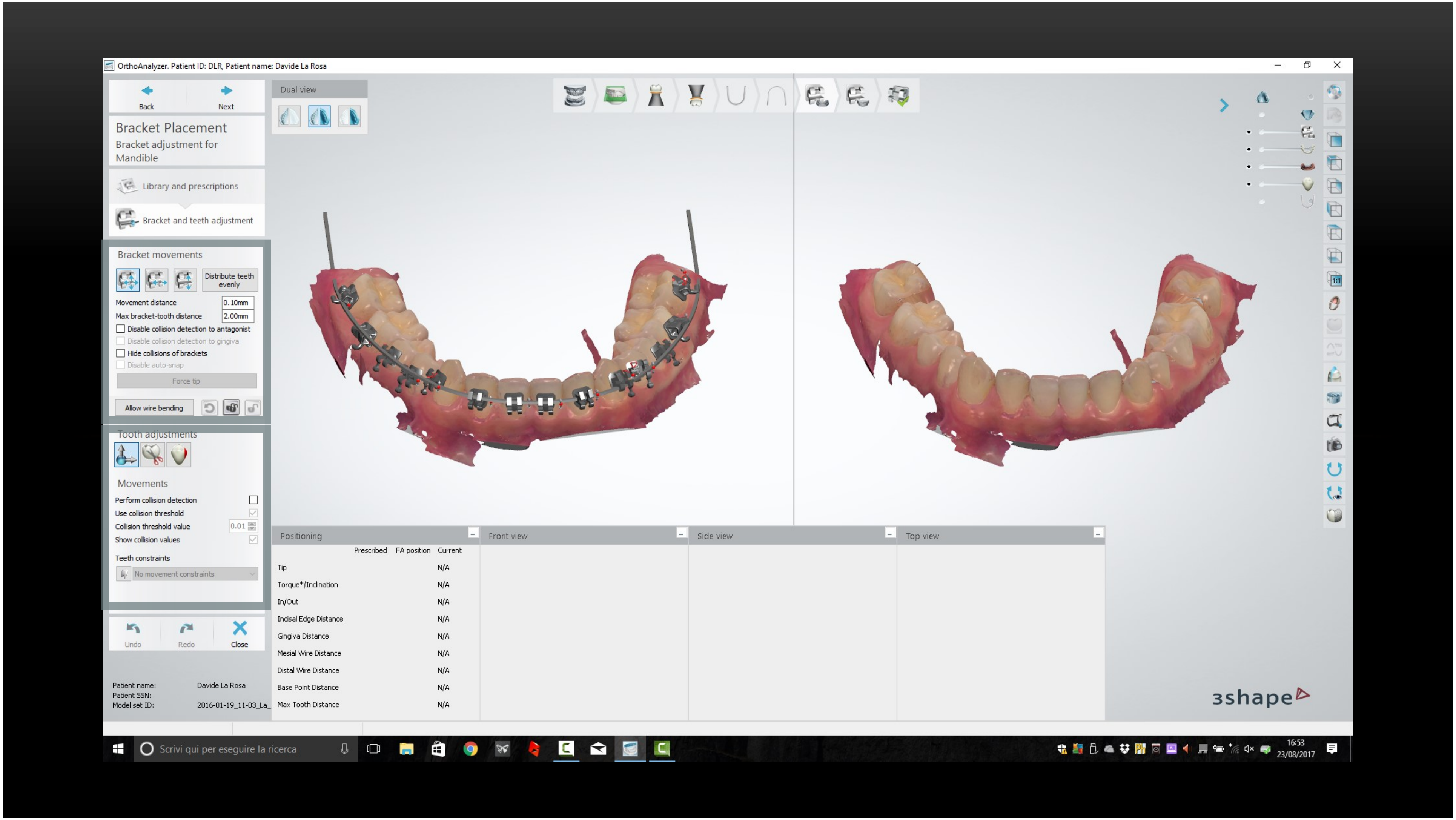
3D Indirect Bonding Root Individualized Prescription

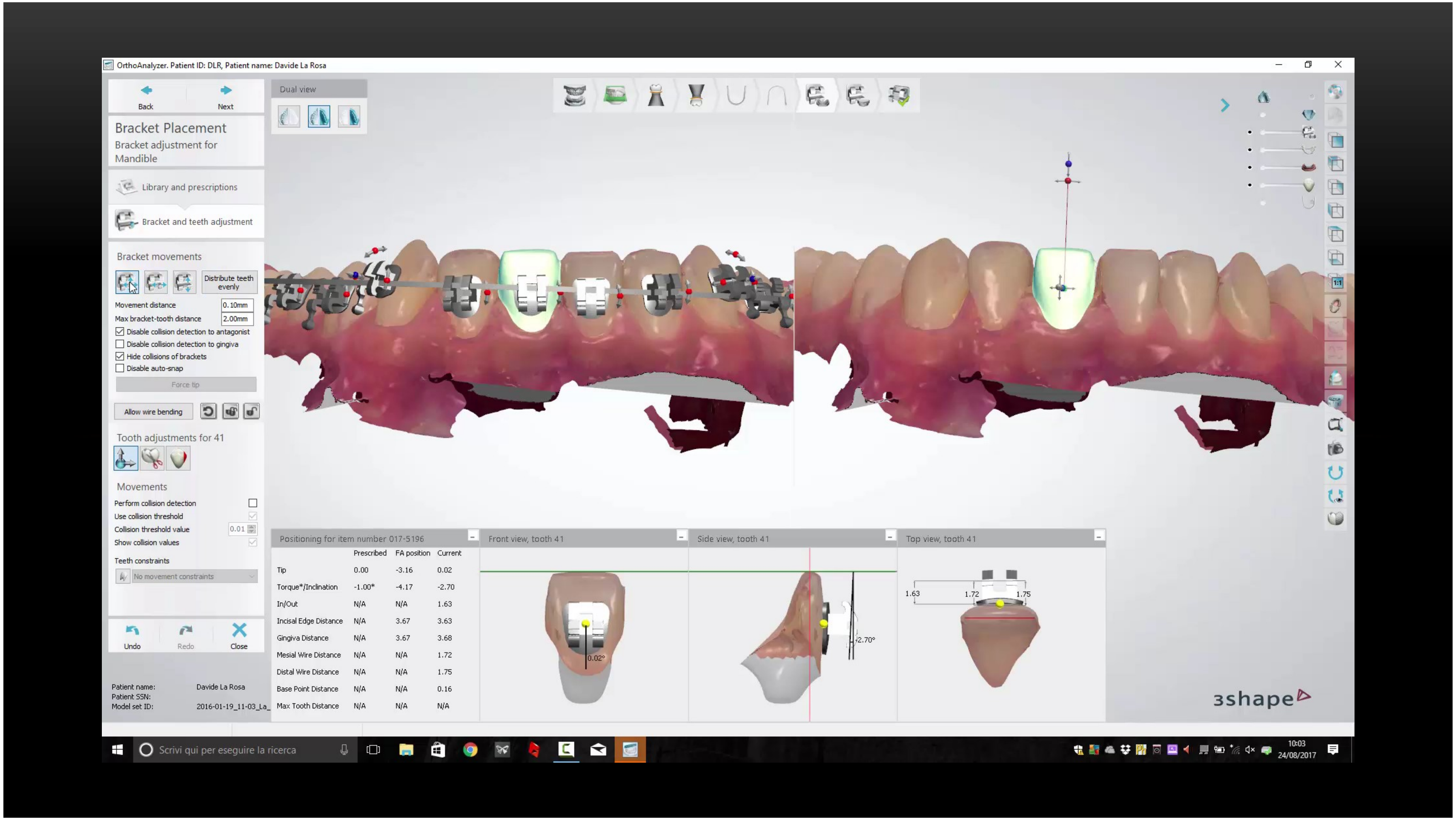
3D Root Individualized Aligner Prescription

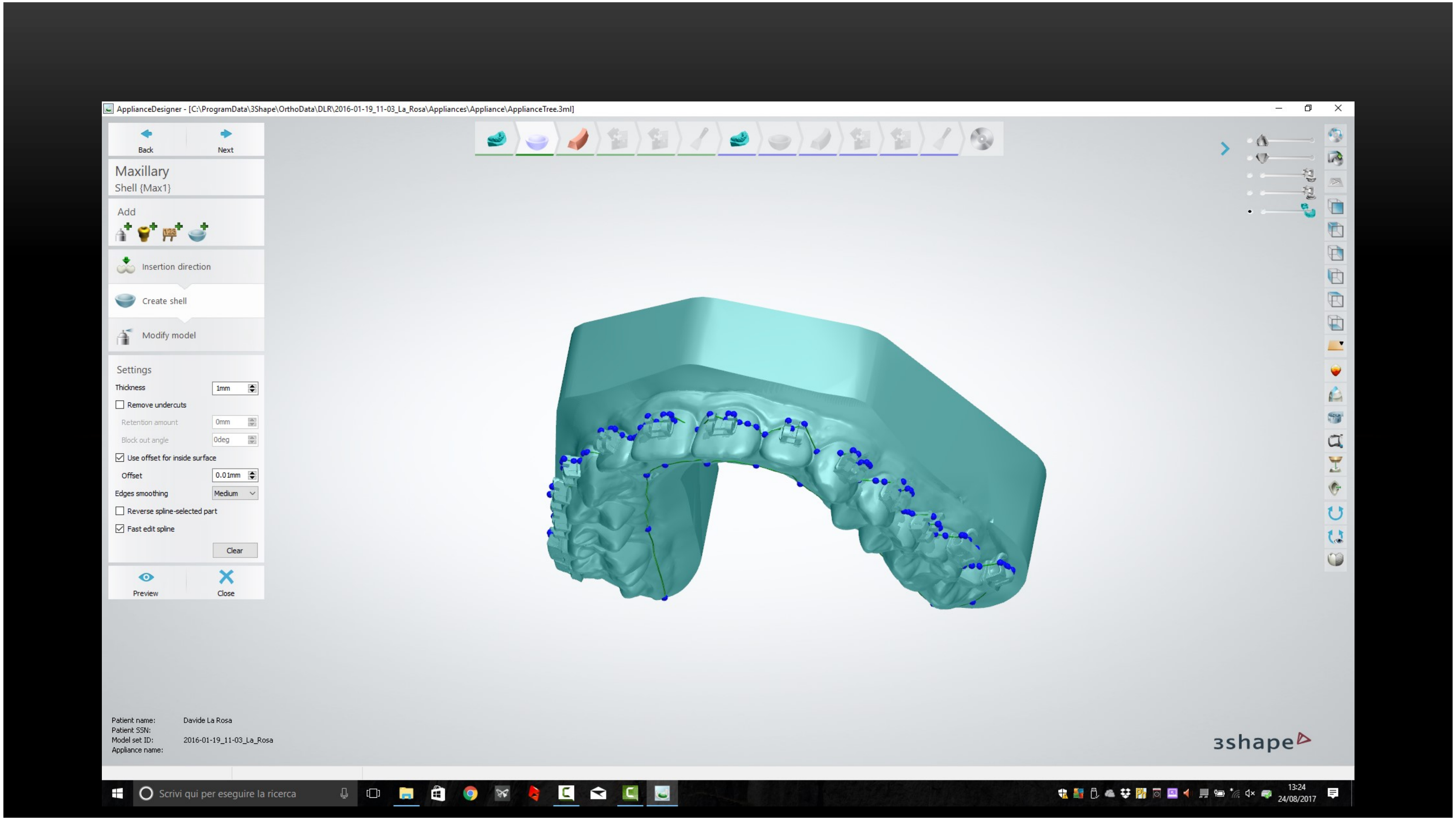
IS IT POSSIBILE TO PREVENT DISTALIZATION/BONE LOSS COUNTEREFFECTS?

3D Root/Crown Individualized Bracket Indirect Bonding Prescription

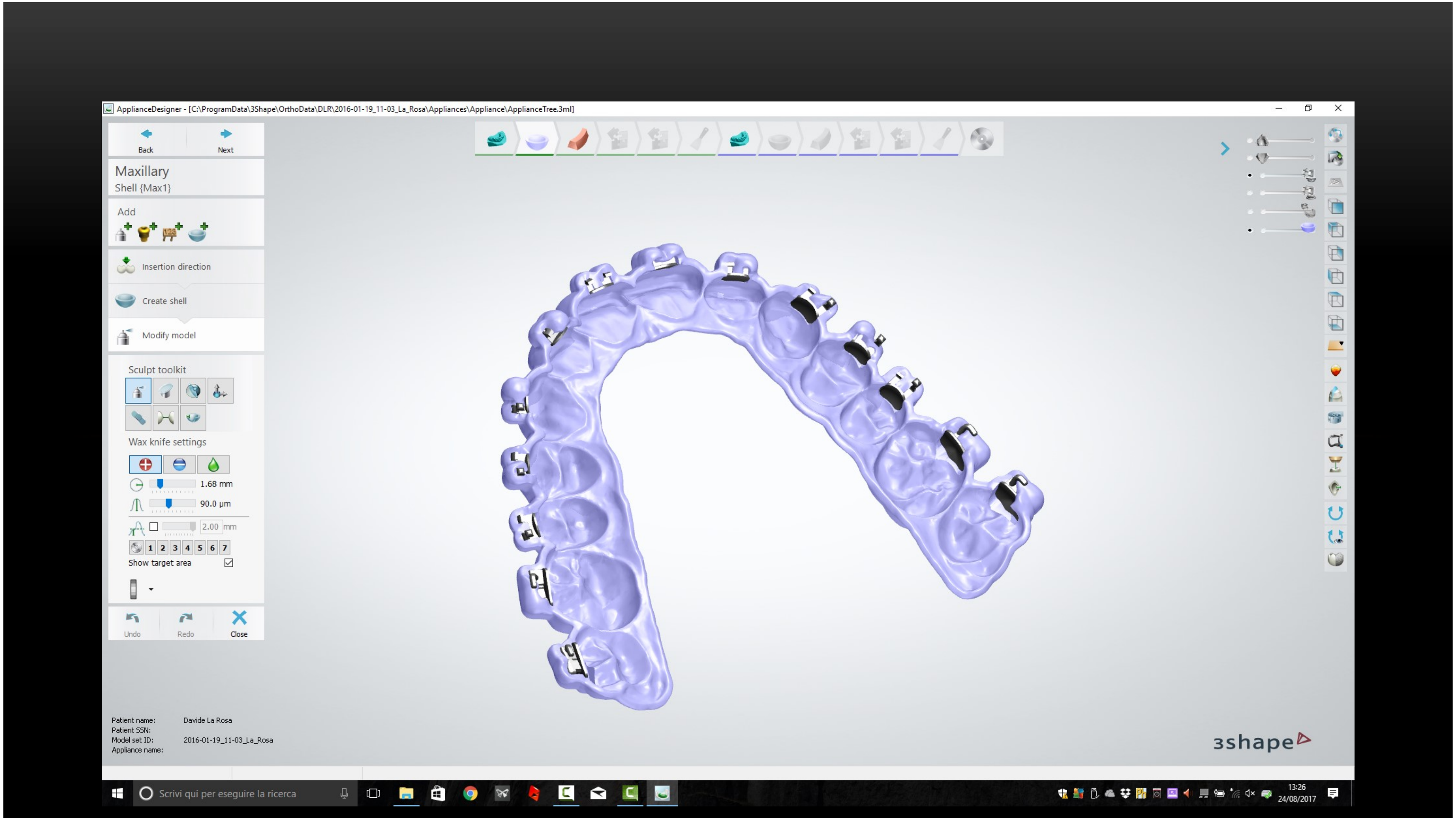
3D Root/Crown Individualized Aligner Prescription

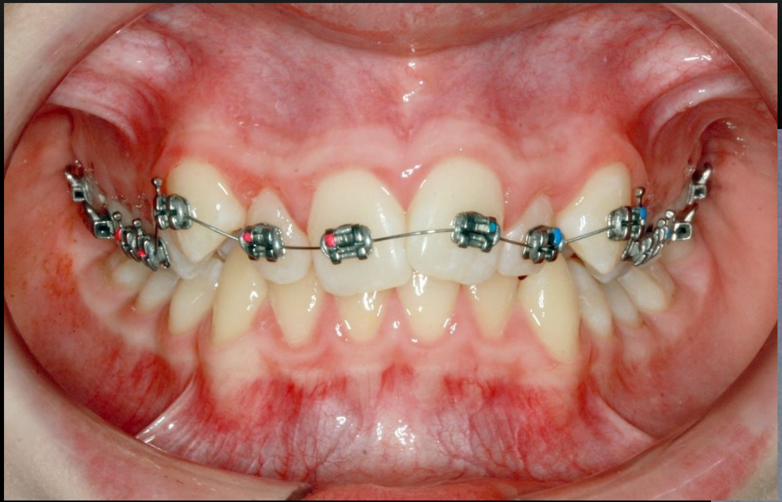

OrthoAnalyzer. Patient ID: DLR, Patient name: Davide La Rosa
Back
Next
Bracket Placement
Bracket adjustment for Mandible
Library and prescriptions
Bracket and teeth adjustment
Bracket movements
Distribute teeth evenly
Movement distance 0.10mm
Max bracket-tooth distance 2.00mm
Disable collision detection to antagonist
Disable collision detection to gingiva
Hide collisions of brackets
Disable auto-snap
Force tip
Allow wire bending
Tooth adjustments
Movements
Perform collision detection
Use collision threshold
Collision threshold value 0.01
Show collision values
Teeth constraints
No movement constraints
Undo
Redo
Close
Patient name: Davide La Rosa
Patient SSN:
Model set ID: 2016-01-19_11-03_La_
Dual view
Positioning
Prescribed
FA position
Current
Tip N/A
Torque*/Inclination N/A
In/Out N/A
Incisal Edge Distance N/A
Gingiva Distance N/A
Mesial Wire Distance N/A
Distal Wire Distance N/A
Base Point Distance N/A
Max Tooth Distance N/A
Front view
Side view
Top view
3shape
Scrivi qui per eseguire la ricerca
16:53
23/08/2017


OrthoAnalyzer. Patient ID: DLR, Patient name: Davide La Rosa
Back
Next
Bracket Placement
Bracket adjustment for Mandible
Library and prescriptions
Bracket and teeth adjustment
Bracket movements
Distribute teeth evenly
Movement distance
0.10mm
Max bracket-tooth distance
2.00mm
Disable collision detection to antagonist
Disable collision detection to gingiva
Hide collisions of brackets
Disable auto-snap
Force tip
Allow wire bending
Tooth adjustments for 41
Movements
Perform collision detection
Use collision threshold
Collision threshold value
0.01
Show collision values
Teeth constraints
No movement constraints
Undo
Redo
Close
Patient name:
Davide La Rosa
Patient SSN:
Model set ID:
2016-01-19_11-03_La_
Dual view
Positioning for item number 017-5196
Prescribed
FA position
Current
Tip
0.00
-3.16
0.02
Torque*/Inclination
-1.00*
-4.17
-2.70
In/Out
N/A
N/A
1.63
Incisal Edge Distance
N/A
3.67
3.63
Gingiva Distance
N/A
3.67
3.68
Mesial Wire Distance
N/A
N/A
1.72
Distal Wire Distance
N/A
N/A
1.75
Base Point Distance
N/A
N/A
0.16
Max Tooth Distance
N/A
N/A
N/A
Front view, tooth 41
0.02°
Side view, tooth 41
-2.70°
Top view, tooth 41
1.63
1.72
1.75
3shape
Scrivi qui per eseguire la ricerca
10:03
24/08/2017

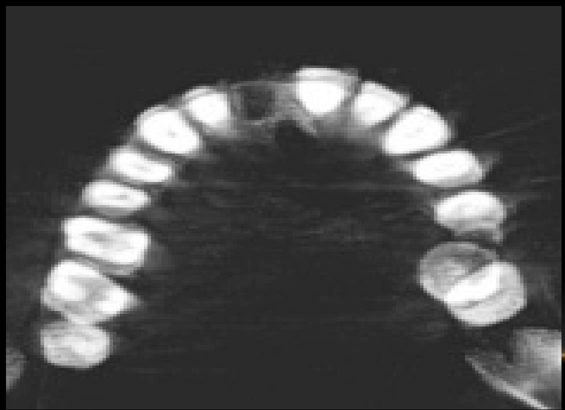


ApplianceDesigner - [C:\ProgramData\3Shape\OrthoData\DLR\2016-01-19_11-03_La_Rosa\Appliances\Appliance\ApplianceTree.3ml]
Back
Next
Maxillary
Shell (Max1)
Add
Insertion direction
Create shell
Modify model
Settings
Thickness
1mm
Remove undercuts
Retention amount
0mm
Block out angle
0deg
Use offset for inside surface
Offset
0.01mm
Edges smoothing
Medium
Reverse spline-selected part
Fast edit spline
Clear
Preview
Close
Patient name:
Davide La Rosa
Patient SSN:
Model set ID:
2016-01-19_11-03_La_Rosa
Appliance name:
3shape
Scrivi qui per eseguire la ricerca
13:24
24/08/2017


ApplianceDesigner - [C:\ProgramData\3Shape\OrthoData\DLR\2016-01-19_11-03_La_Rosa\Appliances\Appliance\ApplianceTree.3ml]
Back
Next
Maxillary
Shell (Max1)
Add
Insertion direction
Create shell
Modify model
Sculpt toolkit
Wax knife settings
1.68 mm
90.0 µm
2.00 mm
1 2 3 4 5 6 7
Show target area
Undo
Redo
Close
Patient name: Davide La Rosa
Patient SSN:
Model set ID: 2016-01-19_11-03_La_Rosa
Appliance name:
3shape
Scrivi qui per eseguire la ricerca
13:26
24/08/2017



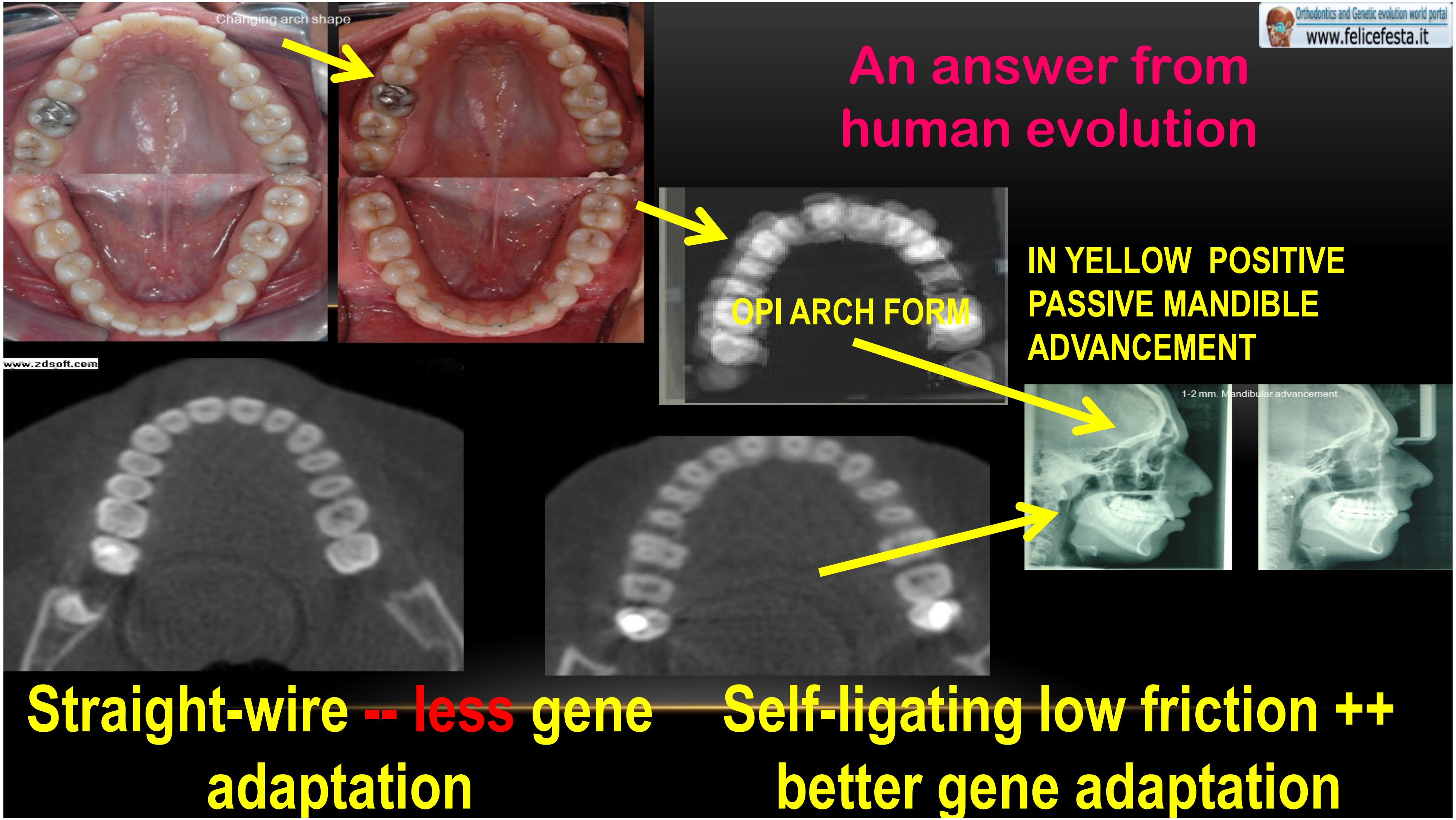
OPI ARCH FORM

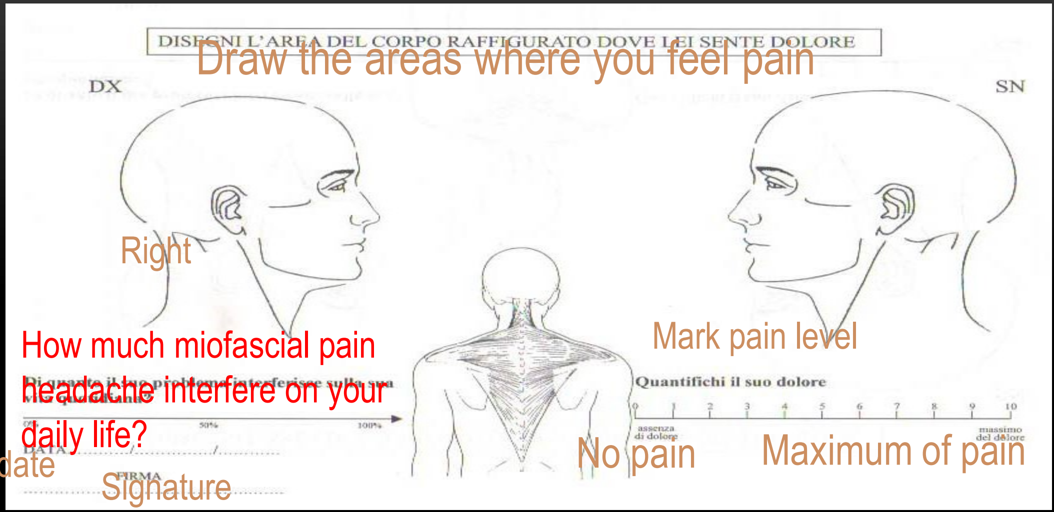


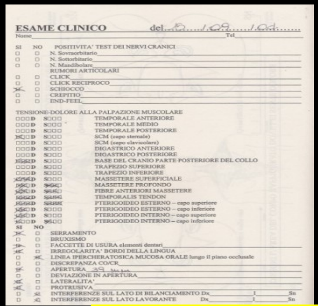
4000 YEARS

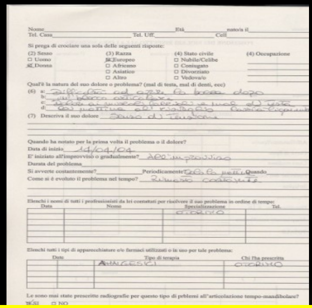
→

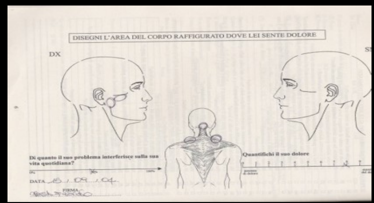
The upper arch has contracted above all in the canine, premolar and first molar area


Changing arch shape
Orthodontics and Genetic evolution world portal
www.felicefesta.it
An answer from
human evolution
OPI ARCH FORM
IN YELLOW POSITIVE
PASSIVE MANDIBLE
ADVANCEMENT
1-2 mm. Mandibular advancement
www.zdsoft.com
Straight-wire -- less gene
adaptation
Self-ligating low friction ++
better gene adaptation









CRANIO THE JOURNAL OF CRANIOMANDIBULAR PRACTICE

Article Title: **Reproducibility of Visual Analog Scale (VAS) Pain Scores to Mechanical Pressure**

Authors: **Greg Goddard, D.D.S.; Hiroyuki Karibe, D.D.S., Ph.D.; Charles McNeill, D.D.S.**

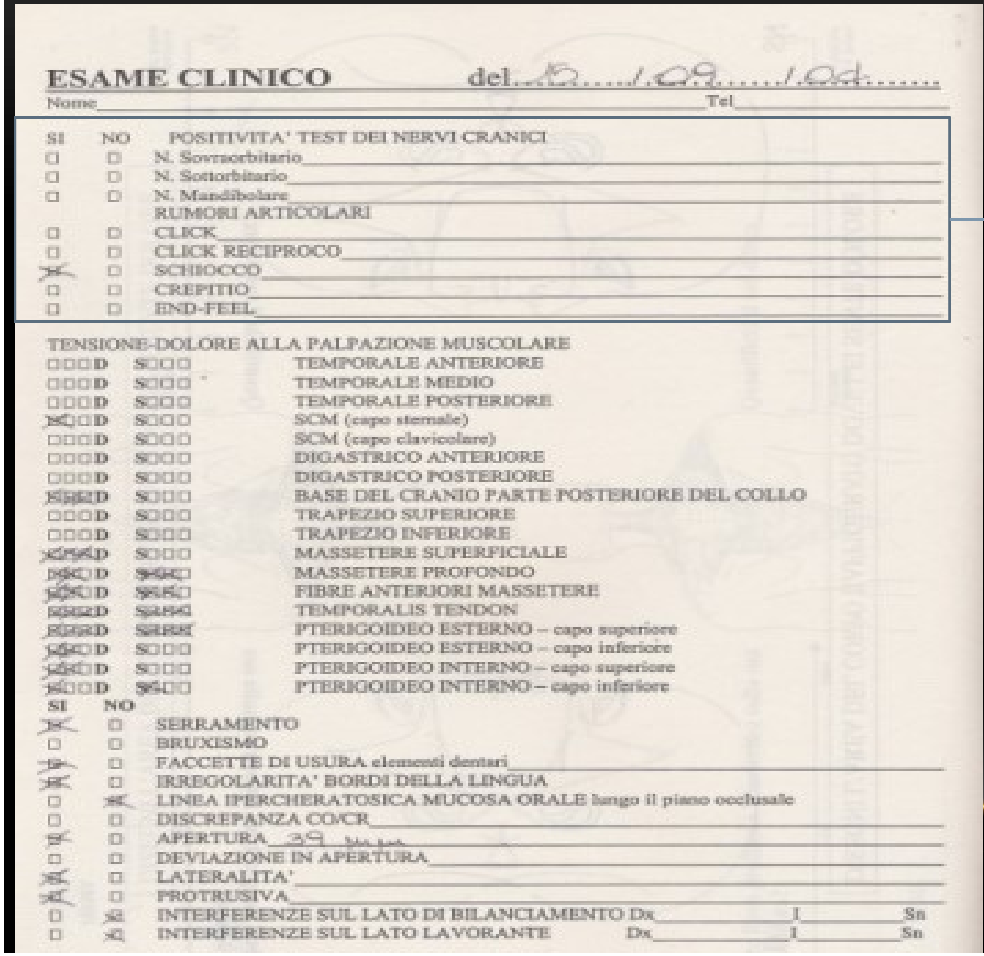
Volume: 22 **Issue:**3 **Journal Date:** **July 2004**

Abstract: ABSTRACT: This study tested the reproducibility of visual analog scale (VAS) pain scores to measure changes in masseter muscle pain evoked by maximally tolerable mechanical stimulation over a short time period in healthy subjects. This study also evaluated gender differences in reproducibility of VAS scores to mechanical stimulation. Ten healthy female and eight healthy male individuals participated in this study. The recordings of VAS pain scores to an identical mechanical pressure on the masseter muscle were performed at three different sessions (T1, T2, and T3). The subjects rated their pain on a VAS to a maximally tolerable stimulus that was recorded on an algometer at the first session. The algometer pressure reading was recorded for each subject and then used to duplicate the same identical mechanical stimulus at each of the three sessions. This identical pressure was repeated in the same marked spot at six minutes and after 30 minutes. The subjects rated the pain on a VAS to this identical stimulus at each session. There was no significant difference in VAS pain scores of all subjects at T1, T2, and T3. There was no significant difference in reproducibility of VAS pain scores in females compared to males. Intraclass correlation coefficients were 0.811 on the right masseter and 0.844 on the left masseter.
VAS pain scores to mechanical stimulation were reproducible over a short
ly
ical

The Tanaka-Chieti Clinical Chart

TMJ CLINICAL DIAGNOSIS: INTRAARTICULAR

EXTRAARTICULAR



ESAME CLINICO del 10/09/04

Nome ______ Tel ______

SI NO POSITIVITA' TEST DEI NERVI CRANICI

N. Sovraorbitario

N. Sottorbitario

N. Mandibolare

RUMORI ARTICOLARI

CLICK

CLICK RECIPROCO

SCHIOCCO

CREPITIO

END-FEEL

TENSIONE-DOLORE ALLA PALPAZIONE MUSCOLARE

D S TEMPORALE ANTERIORE

D S TEMPORALE MEDIO

D S TEMPORALE POSTERIORE

D S SCM (capo sternale)

D S SCM (capo clavicolare)

D S DIGASTRICO ANTERIORE

D S DIGASTRICO POSTERIORE

D S BASE DEL CRANIO PARTE POSTERIORE DEL COLLO

D S TRAPEZIO SUPERIORE

D S TRAPEZIO INFERIORE

D S MASSETERE SUPERFICIALE

D S MASSETERE PROFONDO

D S FIBRE ANTERIORI MASSETERE

D S TEMPORALIS TENDON

D S PTERIGOIDEO ESTERNO – capo superiore

D S PTERIGOIDEO ESTERNO – capo inferiore

D S PTERIGOIDEO INTERNO – capo superiore

D S PTERIGOIDEO INTERNO – capo inferiore

SI NO

SERRAMENTO

BRUXISMO

FACCETTE DI USURA elementi dentari

IRREGOLARITA' BORDI DELLA LINGUA

LINEA IPERCHERATOSICA MUCOSA ORALE lungo il piano occlusale

DISCREPANZA CO/CR

APERTURA 39 mm

DEVIAZIONE IN APERTURA

LATERALITA'

PROTRUSIVA

INTERFERENZE SUL LATO DI BILANCIAMENTO Dx ______ I ______ Sn

INTERFERENZE SUL LATO LAVORANTE Dx ______ I ______ Sn

TMJ CLICKING 20%

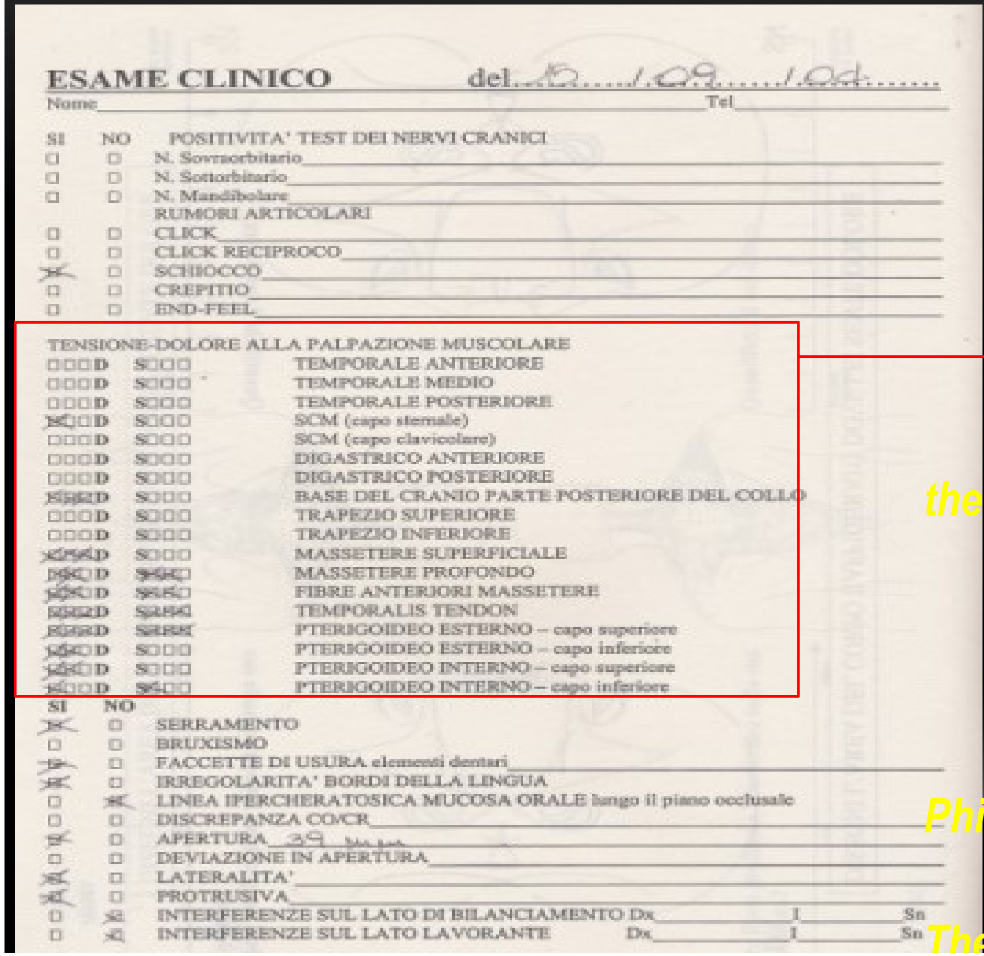
LOCKING

***the splint therapy**. These splints force the mandible to an anterior position for 24 hours a day. This therapy is associated to physical therapy, spray and stretch technique and biofeedback. Once the symptoms are reduced the clinician can go on to the second step.*

Phisical therapy. Tongue exercises+ spine exercises . 6 months

TMJ CLINICAL DIAGNOSIS: INTRAARTICULAR

EXTRAARTICULAR



ESAME CLINICO del 10/09/04

Name ______ Tel ______

SI NO POSITIVITA' TEST DEI NERVI CRANICI
- N. Sovraorbitario
- N. Sottorbitario
- N. Mandibolare

RUMORI ARTICOLARI
- CLICK
- CLICK RECIPROCO
- SCHIOCCO
- CREPITIO
- END-FEEL

TENSIONE-DOLORE ALLA PALPAZIONE MUSCOLARE
- D S TEMPORALE ANTERIORE
- D S TEMPORALE MEDIO
- D S TEMPORALE POSTERIORE
- D S SCM (capo sternale)
- D S SCM (capo clavicolare)
- D S DIGASTRICO ANTERIORE
- D S DIGASTRICO POSTERIORE
- D S BASE DEL CRANIO PARTE POSTERIORE DEL COLLO
- D S TRAPEZIO SUPERIORE
- D S TRAPEZIO INFERIORE
- D S MASSETERE SUPERFICIALE
- D S MASSETERE PROFONDO
- D S FIBRE ANTERIORI MASSETERE
- D S TEMPORALIS TENDON
- D S PTERIGOIDEO ESTERNO – capo superiore
- D S PTERIGOIDEO ESTERNO – capo inferiore
- D S PTERIGOIDEO INTERNO – capo superiore
- D S PTERIGOIDEO INTERNO – capo inferiore

SI NO
- SERRAMENTO
- BRUXISMO
- FACCETTE DI USURA elementi dentari
- IRREGOLARITA' BORDI DELLA LINGUA
- LINEA IPERCHERATOSICA MUCOSA ORALE lungo il piano occlusale
- DISCREPANZA CO/CR
- APERTURA 39 mm
- DEVIAZIONE IN APERTURA
- LATERALITA'
- PROTRUSIVA
- INTERFERENZE SUL LATO DI BILANCIAMENTO Dx ___ I ___ Sn
- INTERFERENZE SUL LATO LAVORANTE Dx ___ I ___ Sn

TMJ TPs/OCCLUSAL SENSE → 80%

Upper passive aligner night wear

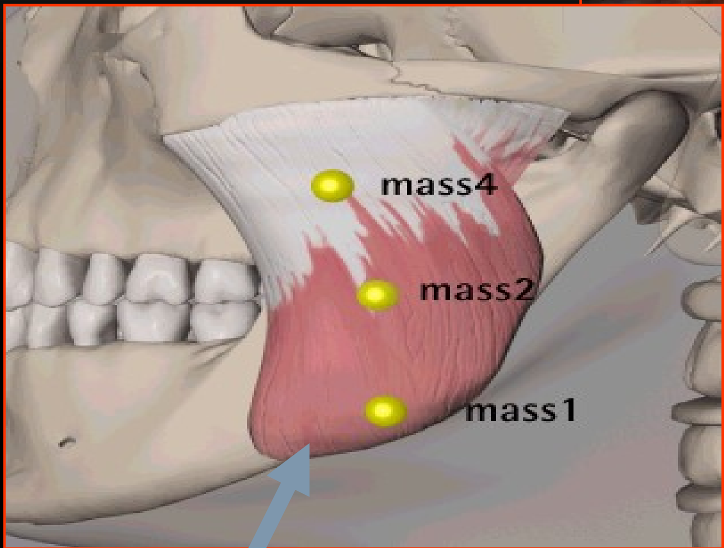
Lower passive aligner day wear

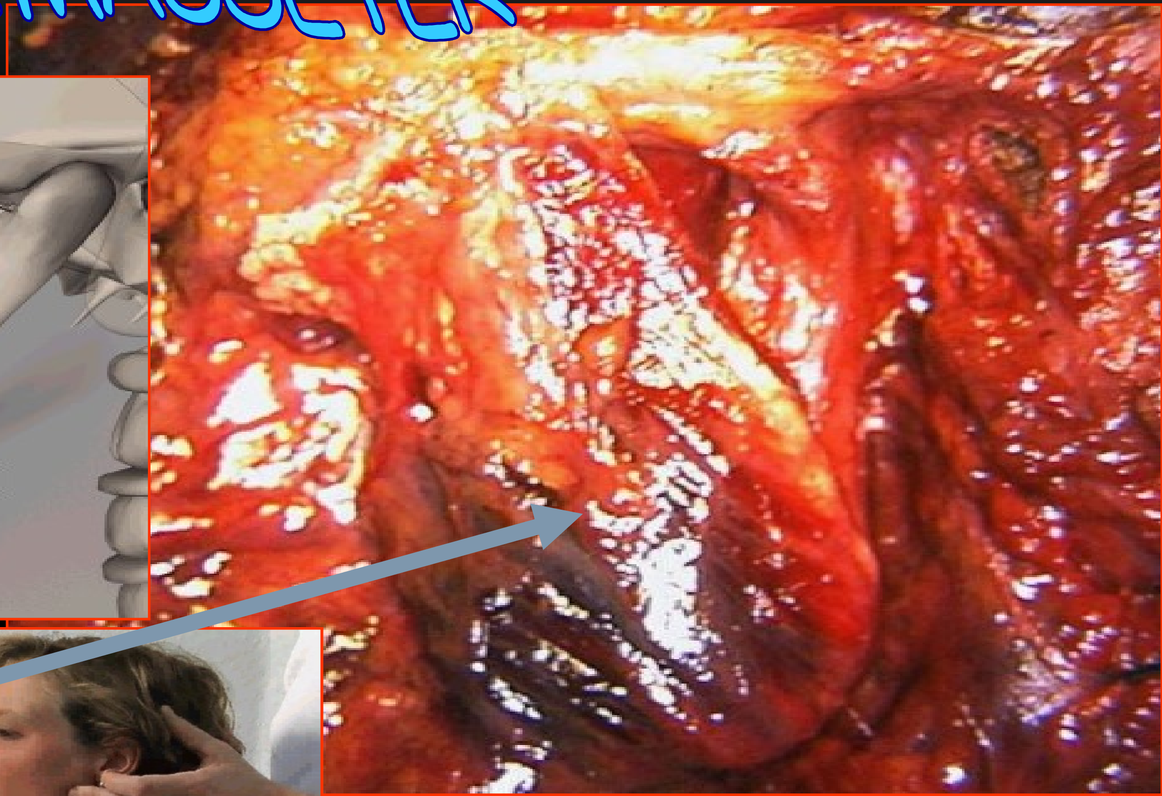
the aligners therapy. *These aligners don't force the mandible to an anterior position for 24 hours a day. This therapy is associated with tongue exercises. Once the symptoms are reduced (2 months) the clinician can go on to the second step.*

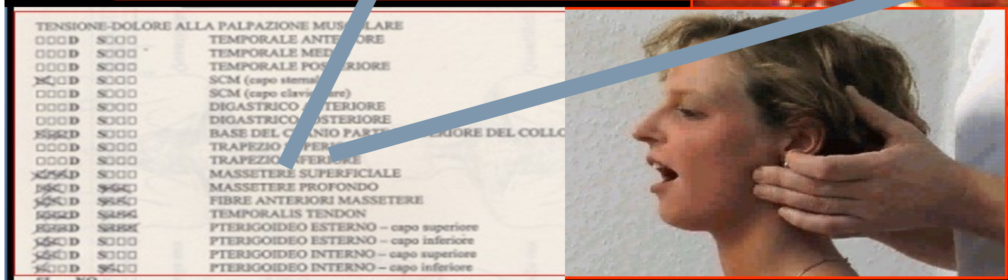
Phisical therapy. Tongue exercises+ spine exercises. 2 months.

The finishing step. *During this phase braces or aligners*

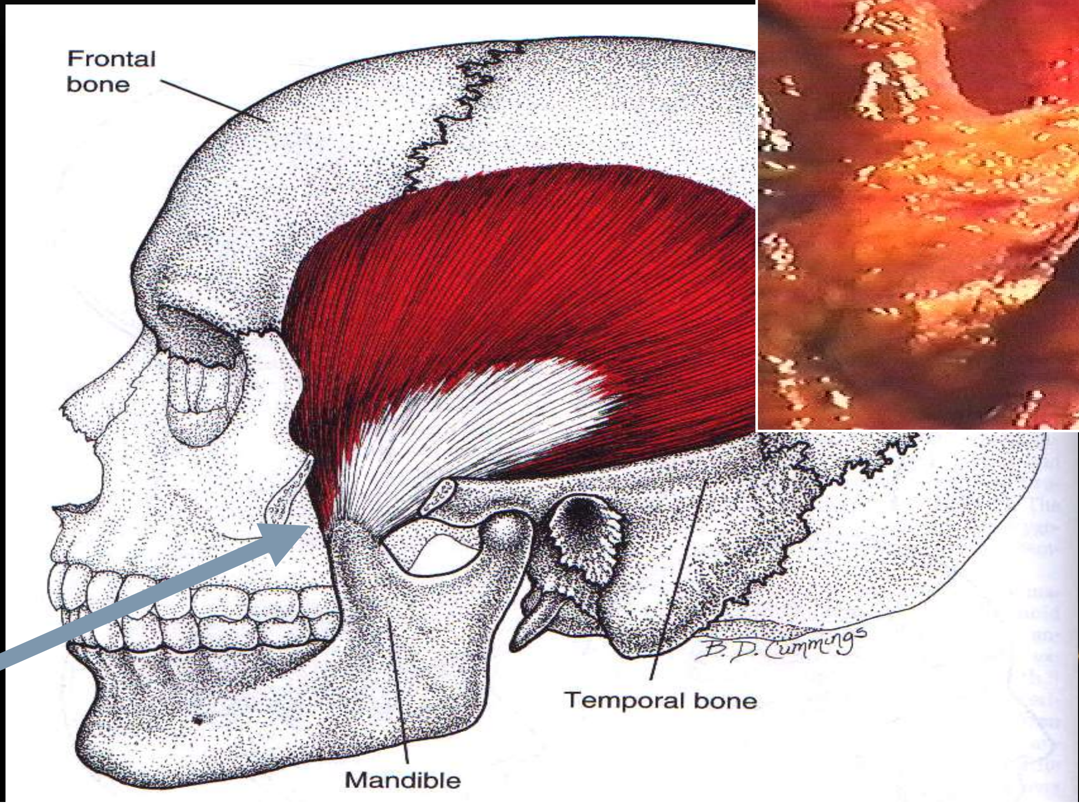
SUPERFICIAL MASSETER

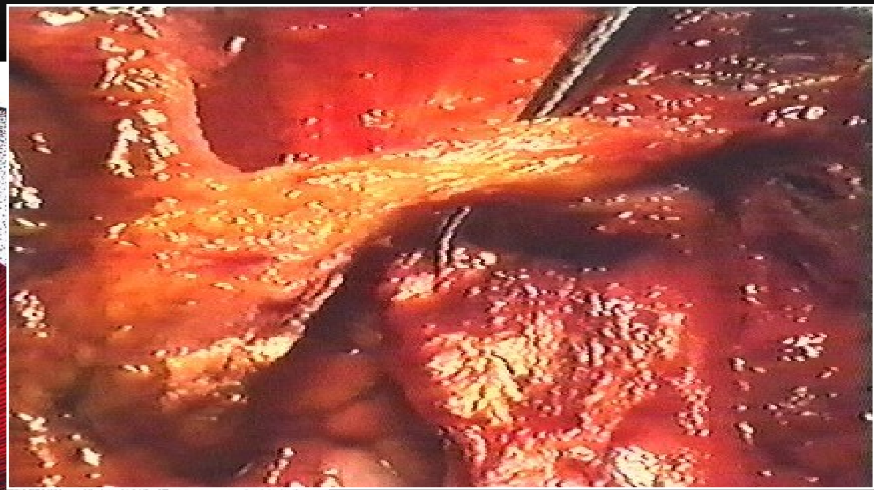


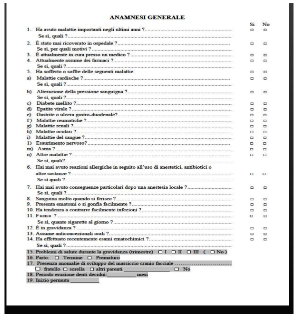


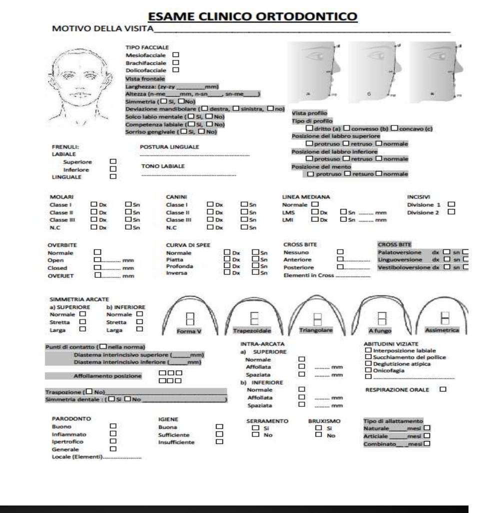


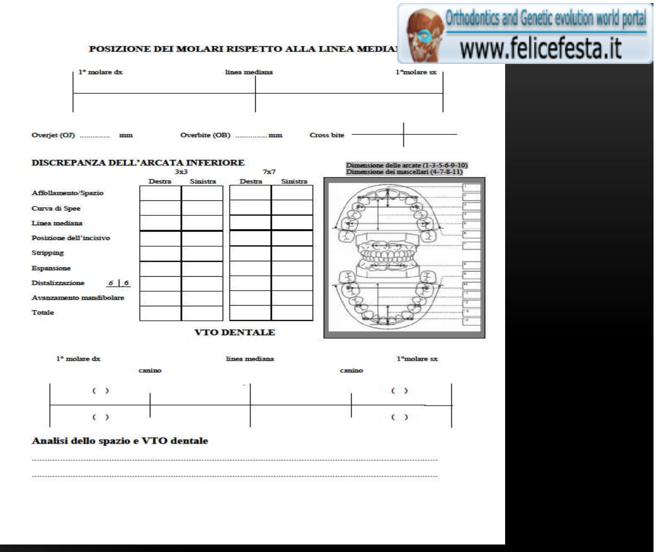
TEMPORALIS TENDON





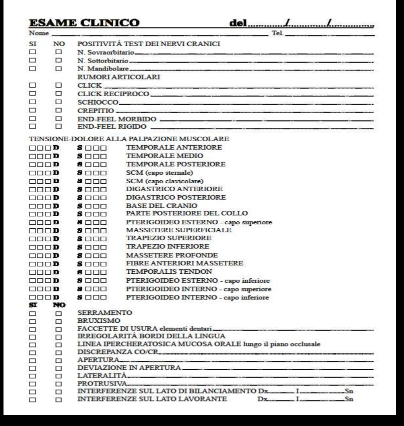


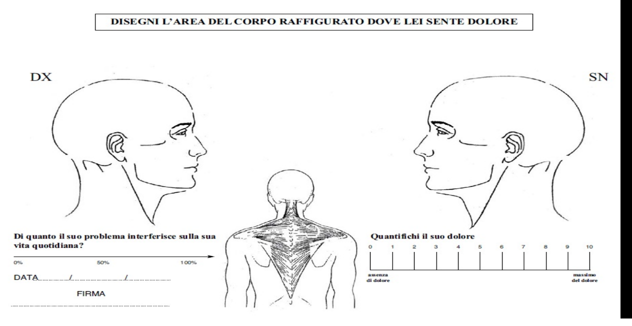


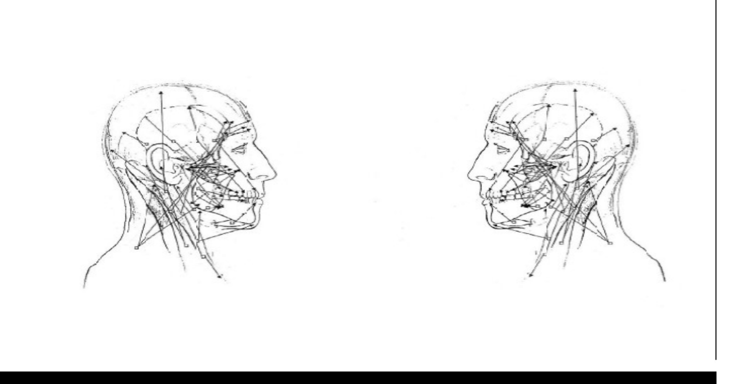


In GREY MOSCOW UNIVERSITY clinical chart area +

In BLACK Chieti UNIVERSITY clinical chart area

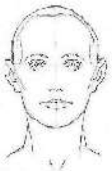






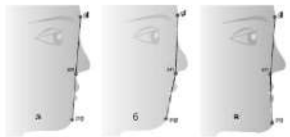
ESAME CLINICO ORTODONTICO

MOTIVO DELLA VISITA____



TIPO FACCIALE
Mesiofacciale ☐
Brachifacciale ☐
Dolicofacciale ☐

Vista frontale
Larghezza: (zy-zy ________mm)
Altezza (n-me____mm, n-sn____, sn-me____)
Simmetria (☐ Si, ☐No)
Deviazione mandibolare (☐ destra, ☐ sinistra, ☐ no)
Solco labio mentale (☐ Si, ☐ No)
Competenza labiale (☐ Si, ☐ No)
Sorriso gengivale (☐ Si, ☐ No)



Vista profilo
Tipo di profilo
☐ dritto (a) ☐ convesso (b) ☐ concavo (c)
Posizione del labbro superiore
☐ protruso ☐ retruso ☐ normale
Posizione del labbro inferiore
☐ protsuso ☐ retruso ☐ normale
Posizione del mento
☐ protruso ☐ retsuro ☐ normale

FRENULI:
LABIALE
Superiore ☐
Inferiore ☐
LINGUALE ☐

POSTURA LINGUALE
....

TONO LABIALE
....

MOLARI
Classe I ☐ Dx ☐ Sn
Classe II ☐ Dx ☐ Sn
Classe III ☐ Dx ☐ Sn
N.C ☐ Dx ☐ Sn

CANINI
Classe I ☐ Dx ☐ Sn
Classe II ☐ Dx ☐ Sn
Classe III ☐ Dx ☐ Sn
N.C ☐ Dx ☐ Sn

LINEA MEDIANA
Normale ☐
LMS ☐ Dx ☐ Sn .... mm
LMI ☐ Dx ☐ Sn .... mm

INCISIVI
Divisione 1 ☐
Divisione 2 ☐

OVERBITE
Normale ☐
Open ☐.......... mm
Closed ☐.......... mm
OVERJET ☐.......... mm

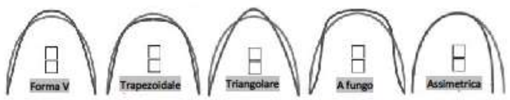
CURVA DI SPEE
Normale ☐ Dx ☐ Sn
Piatta ☐ Dx ☐ Sn
Profonda ☐ Dx ☐ Sn
Inversa ☐ Dx ☐ Sn

CROSS BITE
Nessuno ☐
Anteriore ☐..............
Posteriore ☐..............
Elementi in Cross ....

CROSS BITE
Palatoversione dx ☐ sn ☐
Linguoversione dx ☐ sn ☐
Vestiboloversione dx ☐ sn ☐

SIMMETRIA ARCATE
a) SUPERIORE
Normale ☐
Stretta ☐
Larga ☐

b) INFERIORE
Normale ☐
Stretta ☐
Larga ☐



Punti di contatto (☐ nella norma)
Diastema interincisivo superiore (_____mm)
Diastema interincisivo inferiore (_____mm)

Affollamento posizione ☐☐☐ ☐☐☐

Traspozione (☐ No)________________________________
Simmetria dentale : (☐ Si ☐ No ______________________)

INTRA-ARCATA
a) SUPERIORE
Normale ☐
Affollata ☐ .... mm
Spaziata ☐ .... mm
b) INFERIORE
Normale ☐
Affollata ☐ .... mm
Spaziata ☐ .... mm

ABITUDINI VIZIATE
☐ Interposizione labiale
☐ Succhiamento del pollice
☐ Deglutizione atipica
☐ Onicofagia
☐ ....

RESPIRAZIONE ORALE ☐

PARODONTO
Buono ☐
Infiammato ☐
Ipertrofico ☐
Generale ☐
Locale (Elementi).......................

IGIENE
Buona ☐
Sufficiente ☐
Insufficiente ☐

SERRAMENTO
☐ Si
☐ No

BRUXISMO
☐ Si
☐ No

Tipo di allattamento
Naturale_____mesi ☐
Articiale _____mesi ☐
Combinato__ _mesi ☐

POSIZIONE DEI MOLARI RISPETTO ALLA LINEA MEDIANA

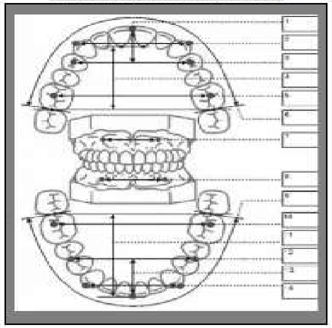
1° molare dx — linea mediana — 1°molare sx

Overjet (OJ) .... mm   Overbite (OB) .... mm   Cross bite

DISCREPANZA DELL'ARCATA INFERIORE

	3x3 Destra	3x3 Sinistra	7x7 Destra	7x7 Sinistra
Affollamento/Spazio				
Curva di Spee				
Linea mediana				
Posizione dell'incisivo				
Stripping				
Espansione				
Distalizzazione 6 | 6				
Avanzamento mandibolare				
Totale				

Dimensione delle arcate (1-3-5-6-9-10)
Dimensione dei mascellari (4-7-8-11)



VTO DENTALE

1° molare dx — canino — linea mediana — canino — 1°molare sx

( )   ( )
( )   ( )

Analisi dello spazio e VTO dentale

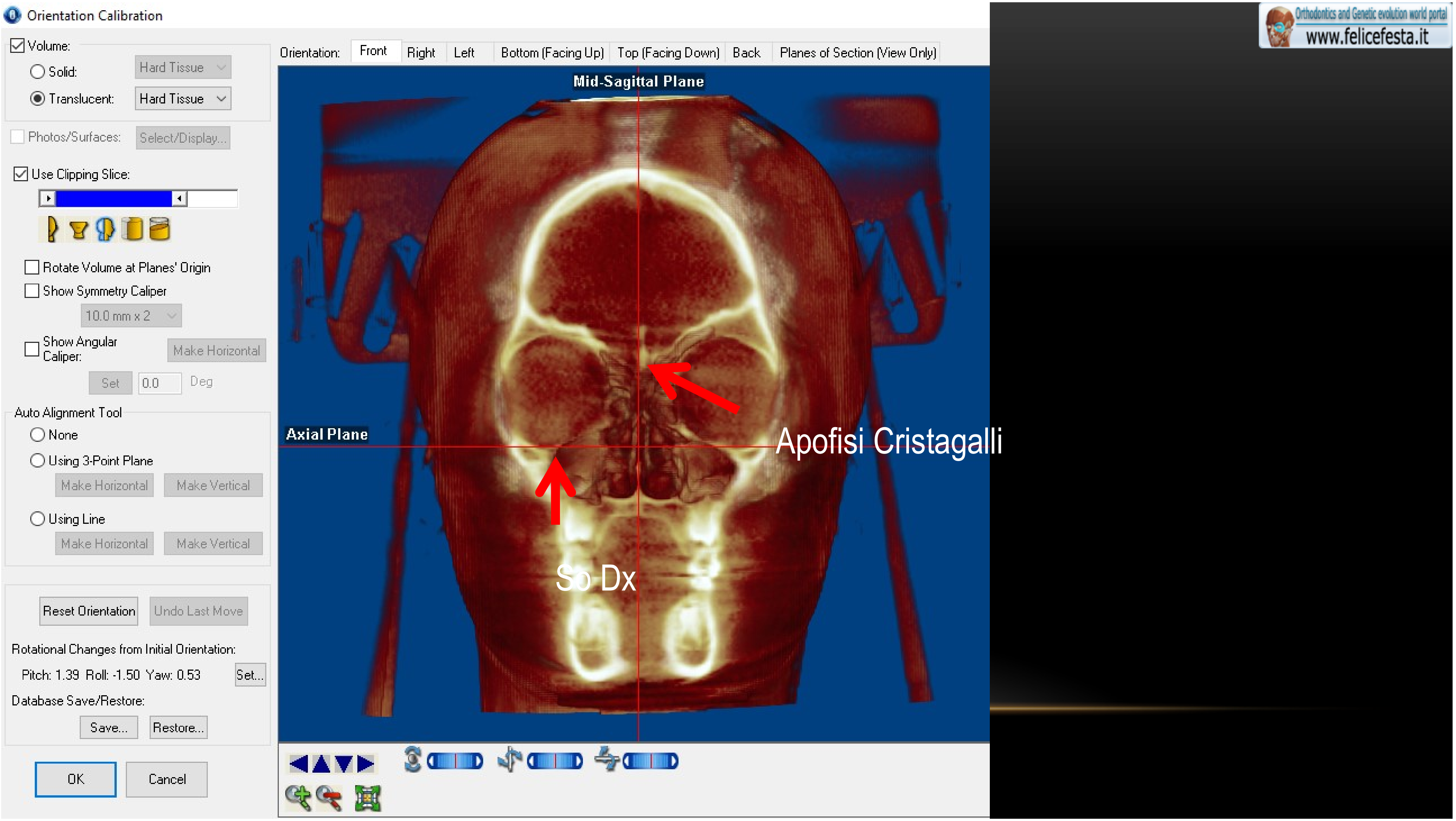
....

....

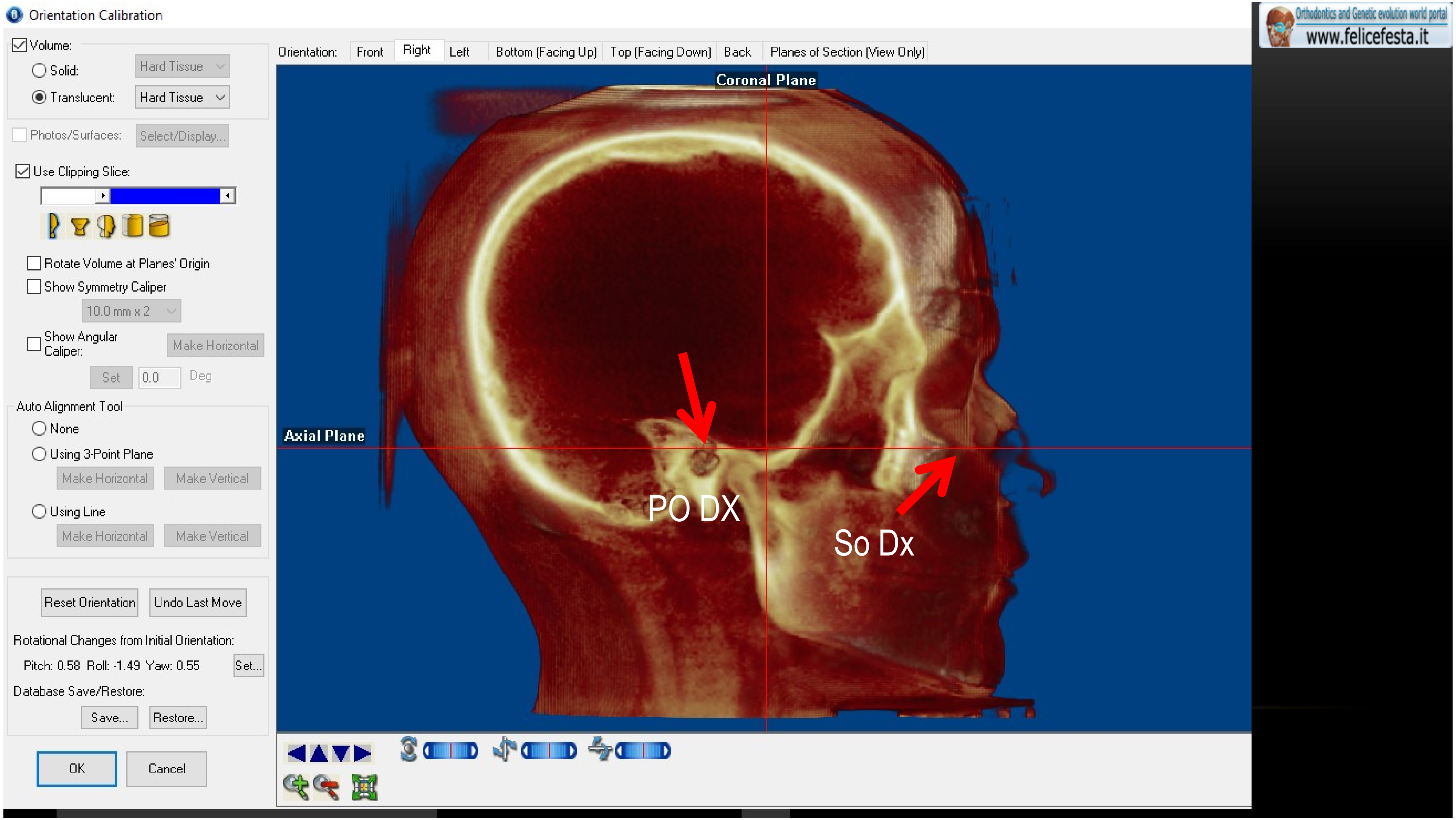
NETWORK>MANAGEMENT SOFTWARES> >TMJ/ORTHODONTICS CLINICAL CHART> >DOLPHIN 3D>

- Transition from 2D to 3D Orthodontics
- 1)Segmentation
- 2)Orientation
- 3)Virtual 2D X-Rays development (lateral>ortophantomography>TMJ>cross sections>postero-anterior>upper arch submento-vertex>lower arch submento-vertex
- 4)Virtual 2D Cephalometrics >Transition to 3D cehalometrics
- 5) Virtual 3D Muscles Dissections: Right Masseter>Left Masseter

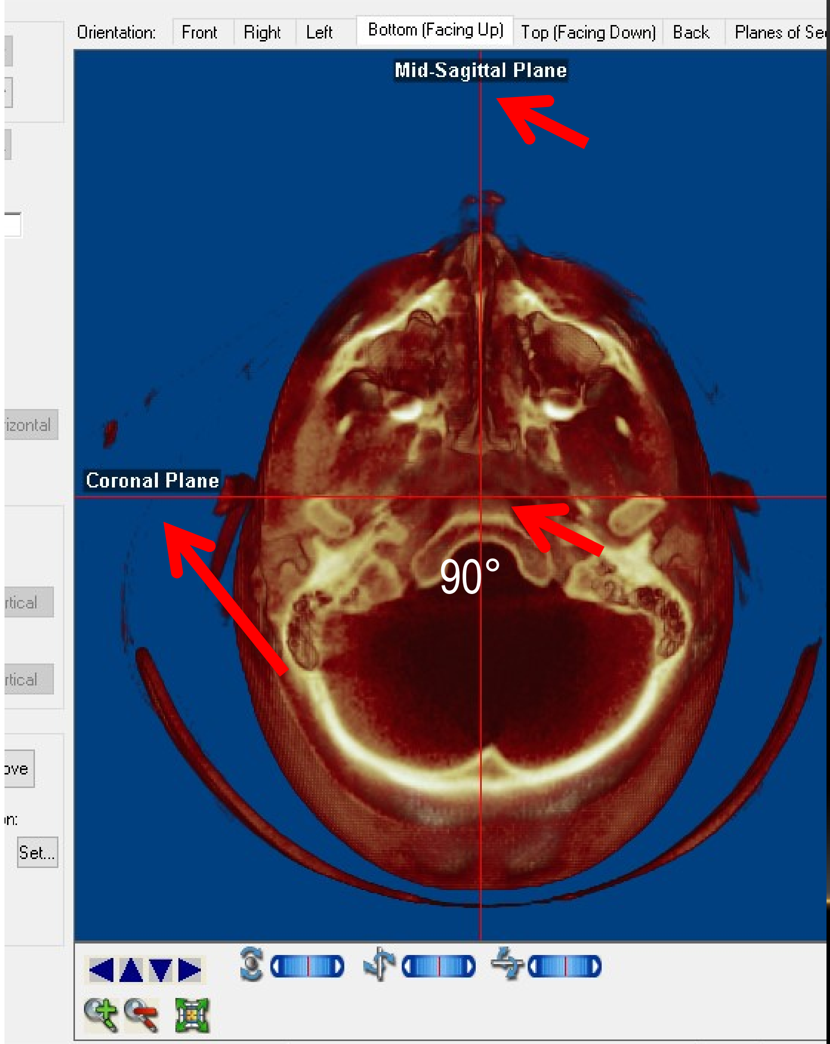
>INTRAORAL SCANNERS



Orientation Calibration
Volume:
Solid:
Hard Tissue
Translucent:
Hard Tissue
Photos/Surfaces:
Select/Display...
Use Clipping Slice:
Rotate Volume at Planes' Origin
Show Symmetry Caliper
10.0 mm x 2
Show Angular Caliper:
Make Horizontal
Set
0.0
Deg
Auto Alignment Tool
None
Using 3-Point Plane
Make Horizontal
Make Vertical
Using Line
Make Horizontal
Make Vertical
Reset Orientation
Undo Last Move
Rotational Changes from Initial Orientation:
Pitch: 1.39 Roll: -1.50 Yaw: 0.53
Set...
Database Save/Restore:
Save...
Restore...
OK
Cancel
Orientation:
Front
Right
Left
Bottom (Facing Up)
Top (Facing Down)
Back
Planes of Section (View Only)
Mid-Sagittal Plane
Axial Plane
Apofisi Cristagalli
Dx
Orthodontics and Genetic evolution world portal
www.felicefesta.it



Orientation Calibration
Volume:
Solid:
Hard Tissue
Translucent:
Hard Tissue
Photos/Surfaces:
Select/Display...
Use Clipping Slice:
Rotate Volume at Planes' Origin
Show Symmetry Caliper
10.0 mm x 2
Show Angular Caliper:
Make Horizontal
Set
0.0
Deg
Auto Alignment Tool
None
Using 3-Point Plane
Make Horizontal
Make Vertical
Using Line
Make Horizontal
Make Vertical
Reset Orientation
Undo Last Move
Rotational Changes from Initial Orientation:
Pitch: 0.58 Roll: -1.49 Yaw: 0.55
Set...
Database Save/Restore:
Save...
Restore...
OK
Cancel
Orientation:
Front
Right
Left
Bottom (Facing Up)
Top (Facing Down)
Back
Planes of Section (View Only)
Coronal Plane
Axial Plane
PO DX
So Dx
Orthodontics and Genetic evolution world portal
www.felicefesta.it


Orientation:
Front
Right
Left
Bottom (Facing Up)
Top (Facing Down)
Back
Mid-Sagittal Plane
Coronal Plane
90°
Set...

Orthodontics and Genetic evolution world portal
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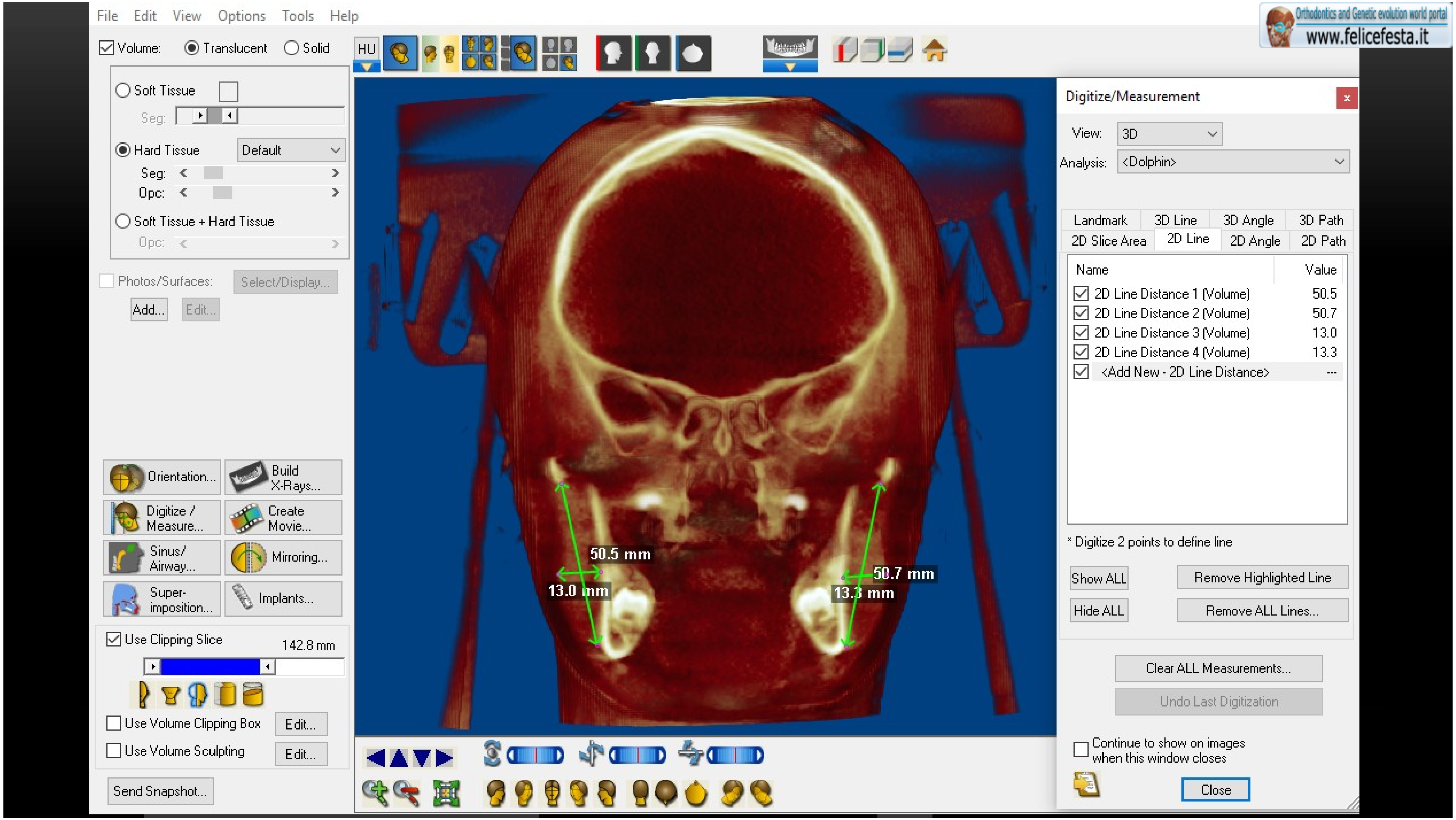
TMJ/ORTHODONTICS CLINICAL CHART
DOLPHIN 3D

- Transition from 2D to 3D Orthodontics
- 1)Segmentation
- 2)Orientation
- 3)Virtual 2D X-Rays development (lateral>ortophantomography>TMJ>cross sections>postero-anterior>upper arch submento-vertex>lower arch submento-vertex
- 4)Virtual 2D Cephalometrics >Transition to 3D cehalometrics
- 5) Virtual 3D Muscles Dissections: Right Masseter>Left Masseter

INTRAORAL SCANNERS


File Edit View Options Tools Help
Orthodontics and Genetic evolution world portal
www.felicefesta.it
Volume: Translucent Solid
HU
Soft Tissue
Seg:
Hard Tissue Default
Seg:
Opc:
Soft Tissue + Hard Tissue
Opc:
Photos/Surfaces: Select/Display...
Add... Edit...
Orientation...
Build X-Rays...
Digitize / Measure...
Create Movie...
Sinus/ Airway...
Mirroring...
Super-imposition...
Implants...
Use Clipping Slice 142.8 mm
Use Volume Clipping Box Edit...
Use Volume Sculpting Edit...
Send Snapshot...
50.5 mm
13.0 mm
50.7 mm
13.3 mm
Digitize/Measurement
View: 3D
Analysis: <Dolphin>
Landmark 3D Line 3D Angle 3D Path
2D Slice Area 2D Line 2D Angle 2D Path
Name Value
2D Line Distance 1 (Volume) 50.5
2D Line Distance 2 (Volume) 50.7
2D Line Distance 3 (Volume) 13.0
2D Line Distance 4 (Volume) 13.3
<Add New - 2D Line Distance> ...
* Digitize 2 points to define line
Show ALL Remove Highlighted Line
Hide ALL Remove ALL Lines...
Clear ALL Measurements...
Undo Last Digitization
Continue to show on images when this window closes
Close

2D 3D TRANSITION

Diagnosis

3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

Treatment

2D Treatment/3D VTO/3D Clincheck/ 3D Treatment/ straight-wire

Appliances

Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Surgical Splint/IDB V2/ Distal Jet

Orthodontically Induced Inflammatory Root Resorption (OIIRR) in a case of upper molars distalization with a tooth borne appliance

P.L.**16 02 2001, 14y 2m**

Dr. Massimo D'Aversa

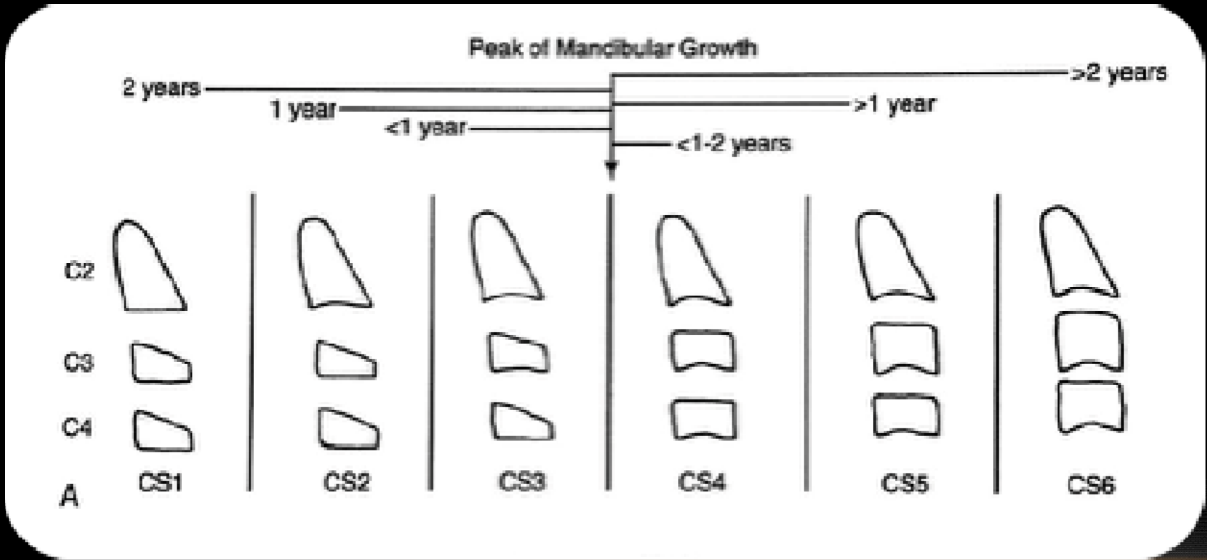
Initial Records

P.L.16 02 2001, 14y 2m

Initial Records

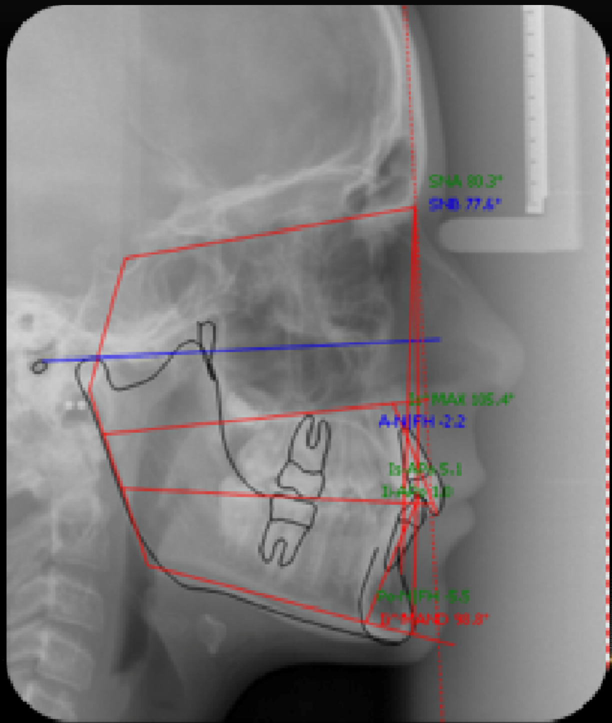
P.L.**16 02 2001, 14y 2m**

Initial Records



P.L. **16 02 2001, 14y 2m**

Initial Records



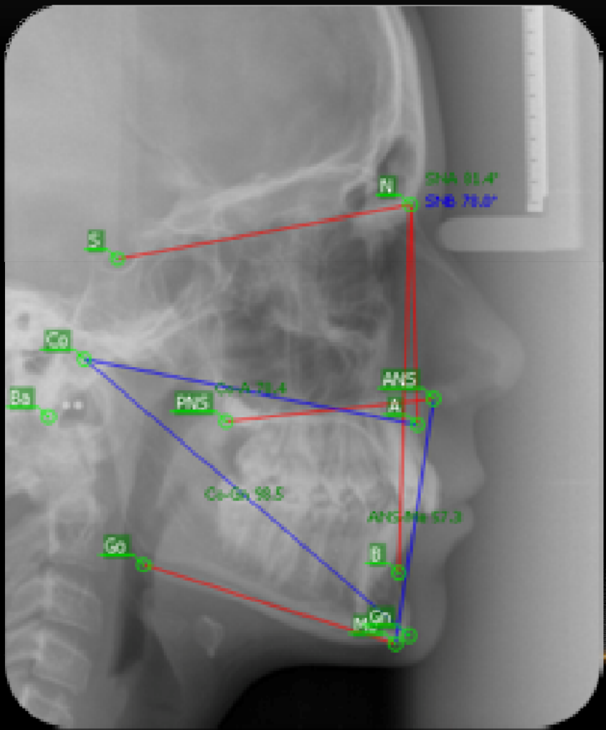
P.L. **16 02 2001, 14y 2m**

Misurazioni

Sigla	Misura	UM	Norma	Diff...	Valutazioni	Normogramma
MISURE SCHELETRICHE ORIZZONTALI						
01 - SNA	80.3	°	82.0±2.0	><	Normoposizione del mascellare sup.	
02 - SNB	77.6	°	80.0±2.0	-2.4	Retrognazia o retrusione della mand.	
03 - ANB	2.7	°	2.0±2.0	><	I classe scheletrica	
04 - A-N|FH	-2.2	mm	0.0±2.0	-2.2	Mascellare retruso	
05 - Po-N|FH	-5.5	mm	-4.0±2.0	><	Mandibola in buona posizione	
06 - W	1.8	mm	-1.0±2.0	+2.8	II classe scheletrica	
MISURE SCHELETRICHE VERTICALI						
07 - GoGn^...	24.8	°	32.0±3.0	-7.2	Ipodivergente	
08 - FMA	17.6	°	26.0±3.0	-8.4	Soggetto brachi-facciale	
09 - MM	20.8	°	28.0±3.0	-7.2	Ipodivergente	
MISURE RIFERITE AI DENTI ANTERIORI						
10 - Is-APo	5.1	mm	5.0±2.0	><	Normoinclinazione incisivi sup.	
11 - Ii-APo	1.0	mm	2.0±2.0	><	Normoposizione incisivi inf.	
12 - Is^MAX	105.4	°	110.0±5.0	><	Normoind. incisivi sup.	
13 - Ii^MAND	98.8	°	95.0±3.0	+3.8	Anteroind. incisivo inf.	

McLaughlin Analysis

Initial Records



P.L.**16 02 2001, 14y 2m**

Misurazioni

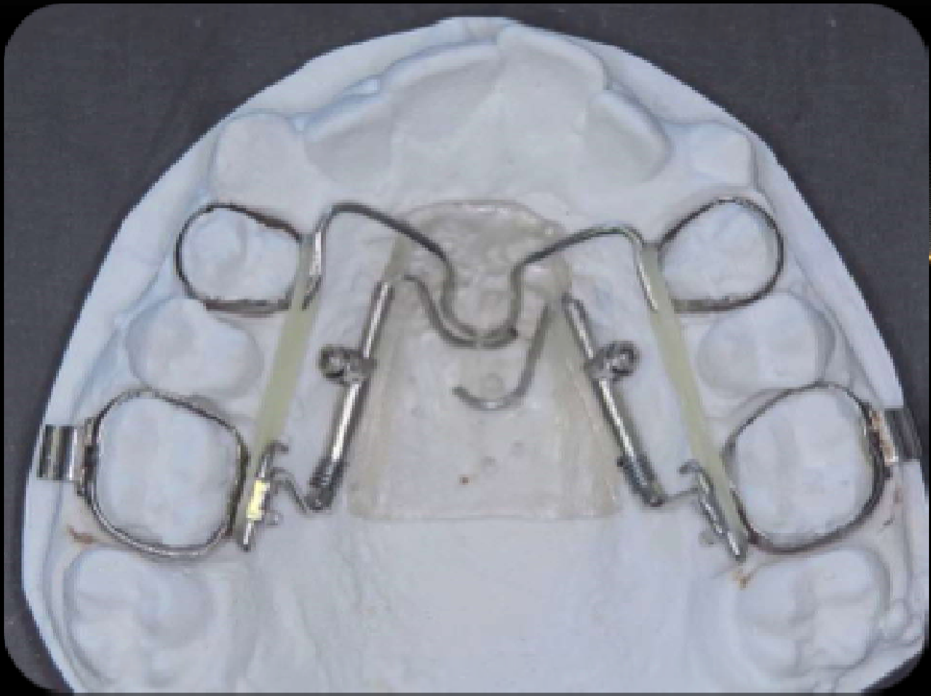
Sigla	Misura	UM	Norma	Diff...	Valutazioni	Normogramma
Angoli misurati						
01 - ML/NSL	27.6	°				
02 - NL/NSL	3.8	°				
03 - SNA	81.4	°	82.0±2.0	><	Normoposizione del mascellare sup.	
04 - SNB	78.0	°	80.0±2.0	-2.0	Retrognazia o retrusione della mand.	
05 - ANB	3.4		2.0±2.0	><	I classe scheletrica	
Angoli attesi						
06 - ML/NSL-A	36.1					
07 - NL/NSL-A	6.8					
Gruppo T						
08 - T1	8.5		3.0±3.0	+5.5	Rotaz. di cresc. anteriore A	
09 - T2	3.0		1.5±1.5	><	Normal bite (N)	
10 - T3	3.4					
TRIANGOLO DI HARVOLD						
11 - Co-A	78.4	mm	78.4±1.0	><		
12 - Co-Gn	98.5	mm	98.5±1.5	><		
13 - ANS-Me	57.3	mm	57.5±0.5	><		

RIASSUNTO VALUTAZIONI

Classificazione A 1NNB
Rotazione di crescita mandibolare => Anteriore
Differ. di potenz. di crescita mascel. e mandib. => Mandibola = Mascella
Relazione intermascellare => Normale
Dimensione verticale => Normal bite
Categoria Auxologica 5

Petrovic Analysis

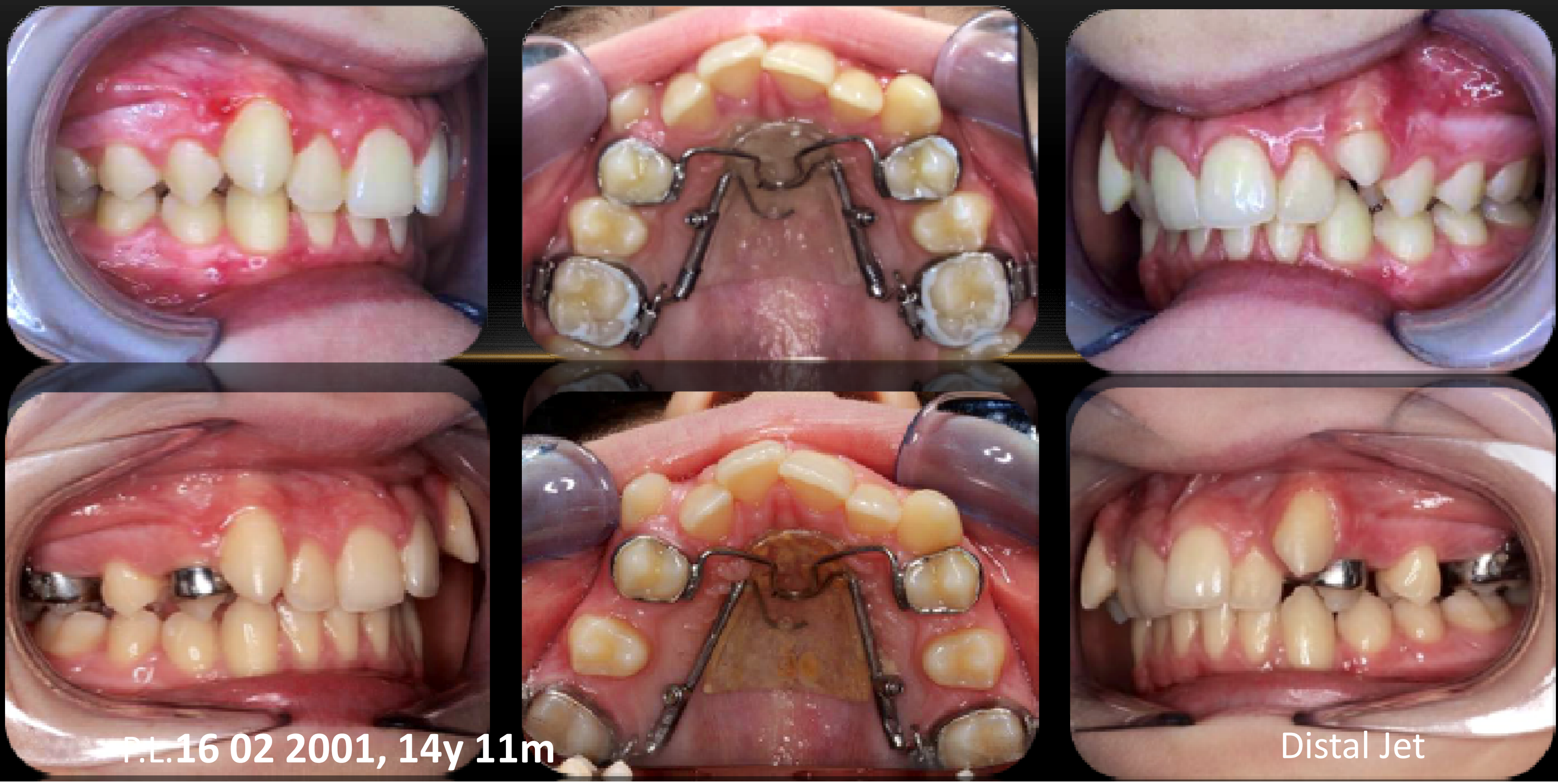
Treatment Sequence



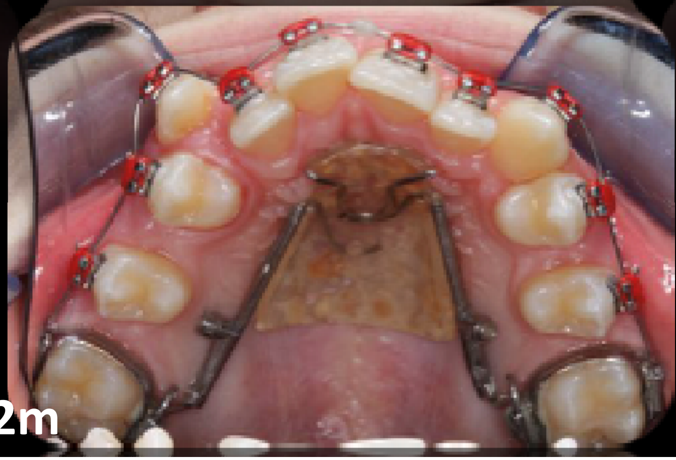
P.L.**16 02 2001, 14y 3m**

Distal Jet

Treatment Sequence



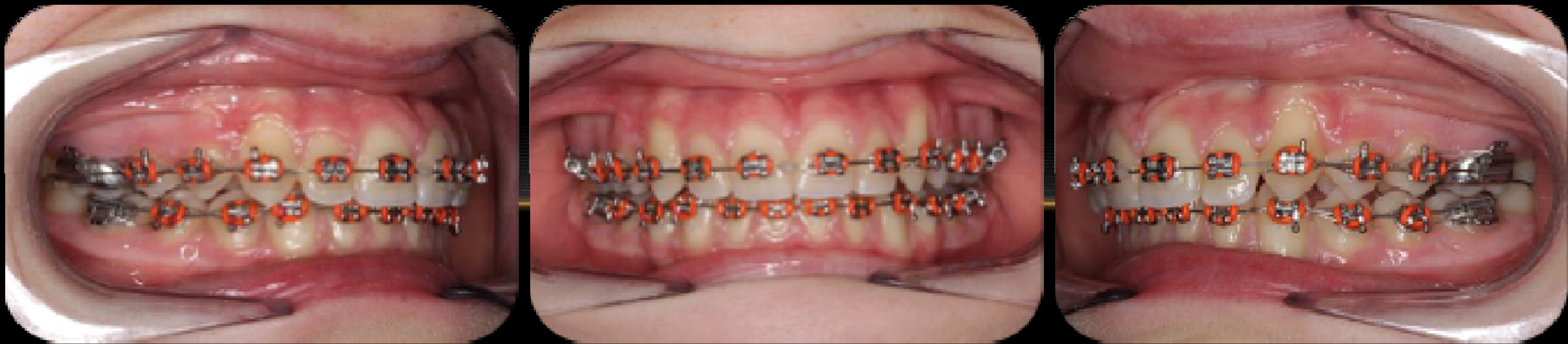
Treatment Sequence



P.L.**16 02 2001, 15y 2m**

Multi bracket appliance

Treatment Sequence



P.L.**16 02 2001, 15y 11m**

Multi bracket appliance

Treatment Sequence

P.L.**16 02 2001, 16y 4m**

Multi bracket appliance

Treatment Sequence

P.L. 16 02 2001, 16y 10m

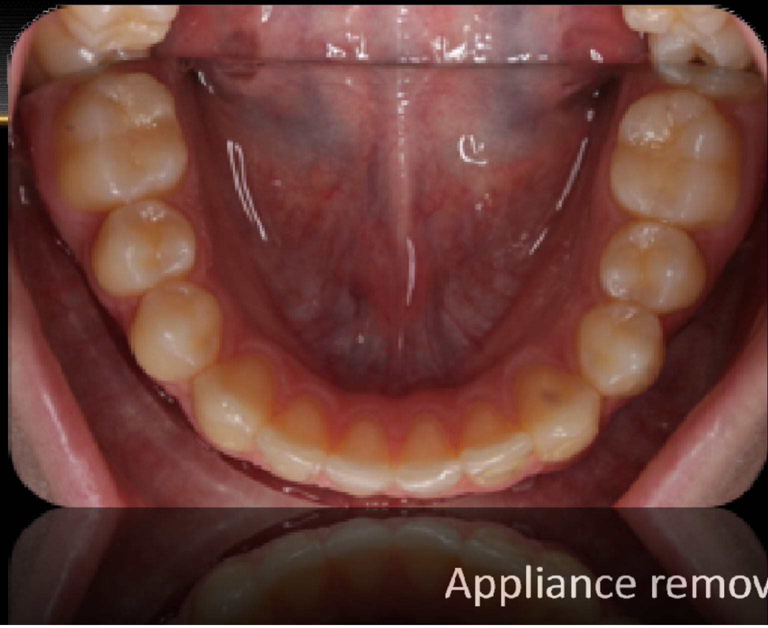
Multi bracket appliance

Final Records

P.L.16 02 2001, 17y 06m

Appliance removal

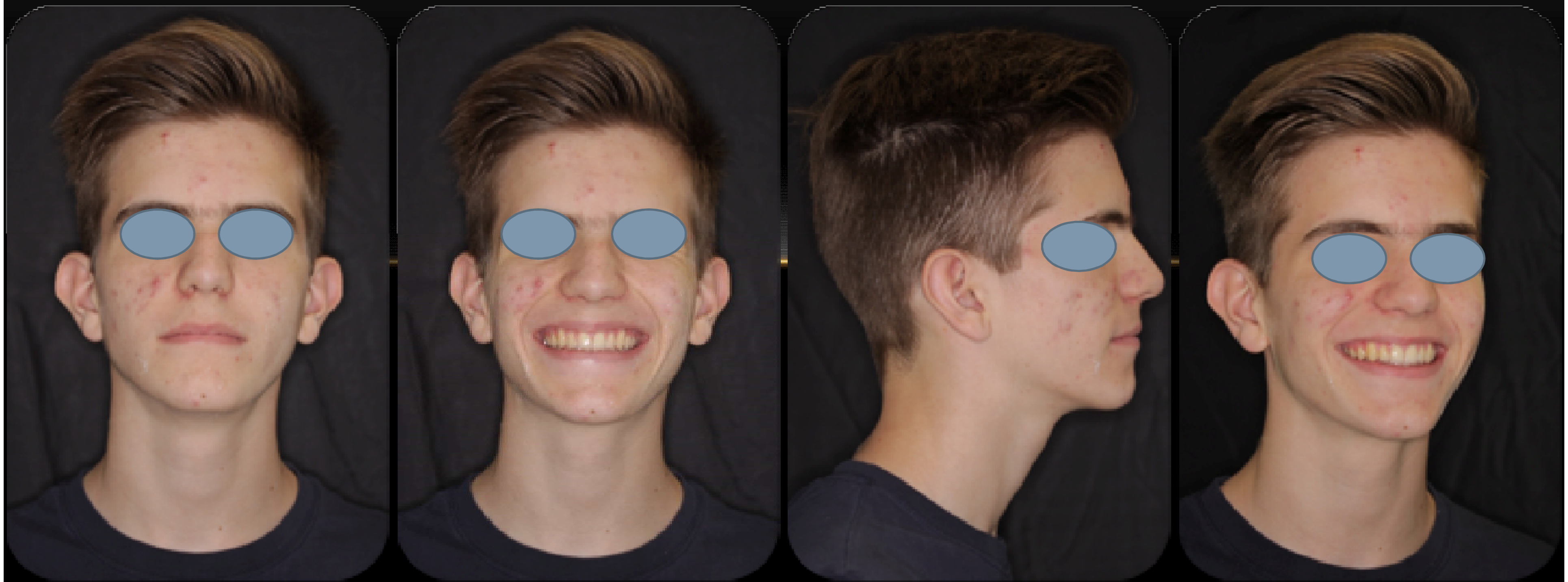
Final Records



P.L. **16 02 2001, 17y 06m**

Appliance removal

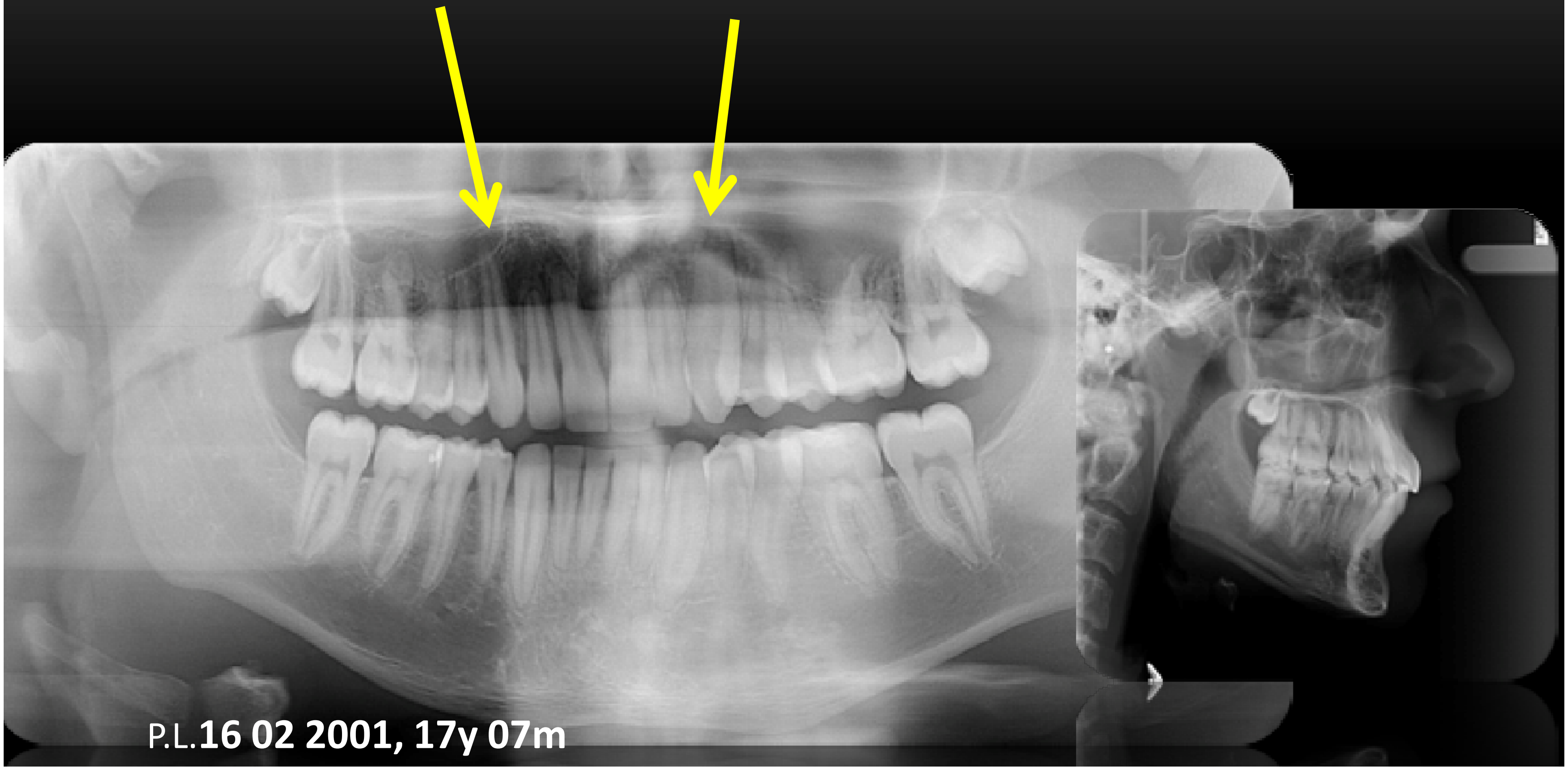
Final Records



P.L.16 02 2001, 17y 06m

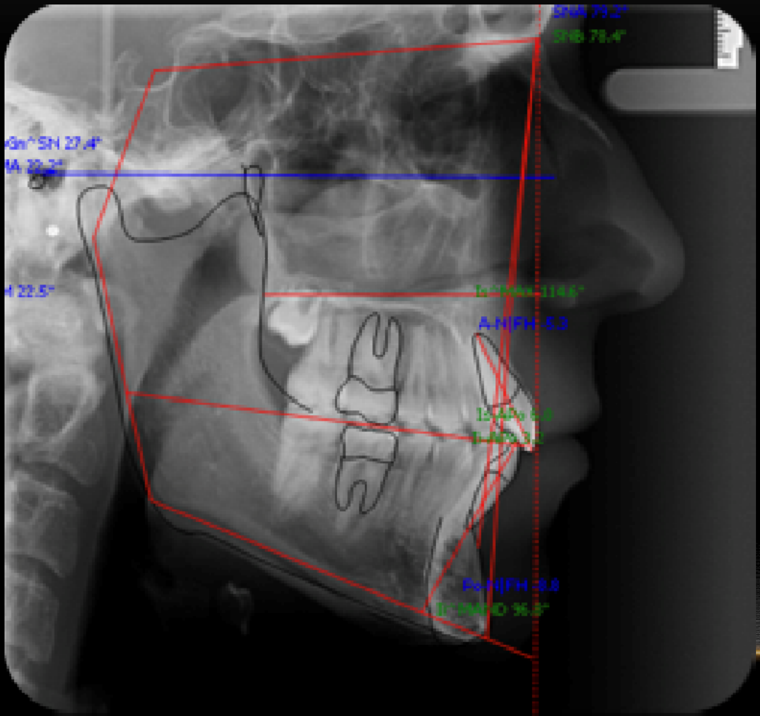
Appliance removal

Final Records



P.L.**16 02 2001, 17y 07m**

Final Records



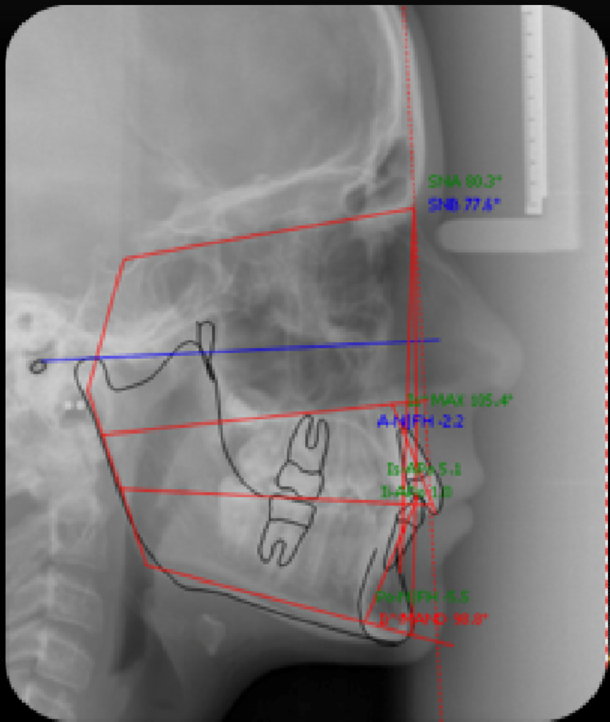
P.L. **16 02 2001, 17y 07m**

Misurazioni

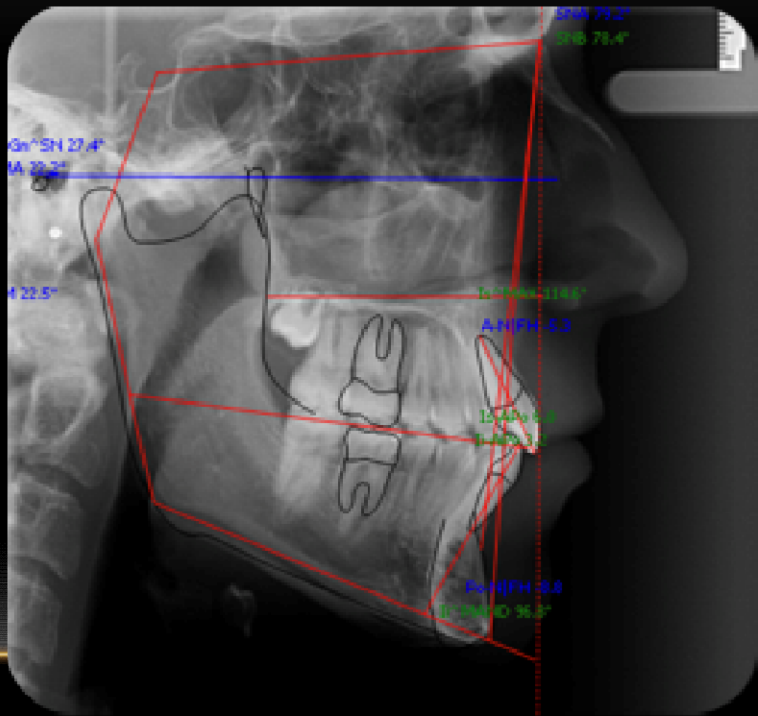
Sigla	Misura	UM	Norma	Diff...	Valutazioni	Normogramma
⊟ **MISURE SCHELETRICHE ORIZZONTALI**						
01 - SNA	79.2	°	82.0±2.0	-2.8	Retrusione del mascellare superiore	
02 - SNB	78.4	°	80.0±2.0	><	Normoposizione della mandibola	
03 - ANB	0.9	°	2.0±2.0	><	I classe scheletrica	
04 - A-N|FH	-5.3	mm	0.0±2.0	-5.3	Mascellare retruso	
05 - Po-N|FH	-8.8	mm	-4.0±2.0	-4.8	Mandibola retrusa	
06 - W	0.1	mm	-1.0±2.0	><	I classe scheletrica	
⊟ **MISURE SCHELETRICHE VERTICALI**						
07 - GoGn^...	27.4	°	32.0±3.0	-4.6	Ipodivergente	
08 - FMA	22.2	°	26.0±3.0	-3.8	Soggetto brachi-facciale	
09 - MM	22.5	°	28.0±3.0	-5.5	Ipodivergente	
⊟ **MISURE RIFERITE AI DENTI ANTERIORI**						
10 - Is-APo	6.0	mm	5.0±2.0	><	Normoinclinazione incisivi sup.	
11 - Ii-APo	3.2	mm	2.0±2.0	><	Normoposizione incisivi inf.	
12 - Is^MAX	114.6	°	110.0±5.0	><	Normoind. incisivi sup.	
13 - Ii^MAND	96.8	°	95.0±3.0	><	Normoind. incisivo inf.	

McLaughlin Analysis

Final Records



P.L.16 02 2001, 17y 07m



McLaughlin Analysis

Final Records

Misurazioni

Sigla	Misura	UM	Norma	Diff...	Valutazioni	Normogra
MISURE SCHELETRICHE ORIZZONTALI						
01 - SNA	80.3	°	82.0±2.0	><	Normoposizione del mascellare sup.	
02 - SNB	77.6	°	80.0±2.0	-2.4	Retrognazia o retrusione della mand.	
03 - ANB	2.7	°	2.0±2.0	><	I classe scheletrica	
04 - A-N|FH	-2.2	mm	0.0±2.0	-2.2	Mascellare retruso	
05 - Po-N|FH	-5.5	mm	-4.0±2.0	><	Mandibola in buona posizione	
06 - W	1.8	mm	-1.0±2.0	+2.8	II classe scheletrica	
MISURE SCHELETRICHE VERTICALI						
07 - GoGn^...	24.8	°	32.0±3.0	-7.2	Ipodivergente	
08 - FMA	17.6	°	26.0±3.0	-8.4	Soggetto brachi-facciale	
09 - MM	20.8	°	28.0±3.0	-7.2	Ipodivergente	
MISURE RIFERITE AI DENTI ANTERIORI						
10 - Is-APo	5.1	mm	5.0±2.0	><	Normoinclinazione incisivi sup.	
11 - Ii-APo	1.0	mm	2.0±2.0	><	Normoposizione incisivi inf.	
12 - Is^MAX	105.4	°	110.0±5.0	><	Normoind. incisivi sup.	
13 - Ii^MAND	98.8	°	95.0±3.0	+3.8	Anteroind. incisivo inf.	

Misurazioni

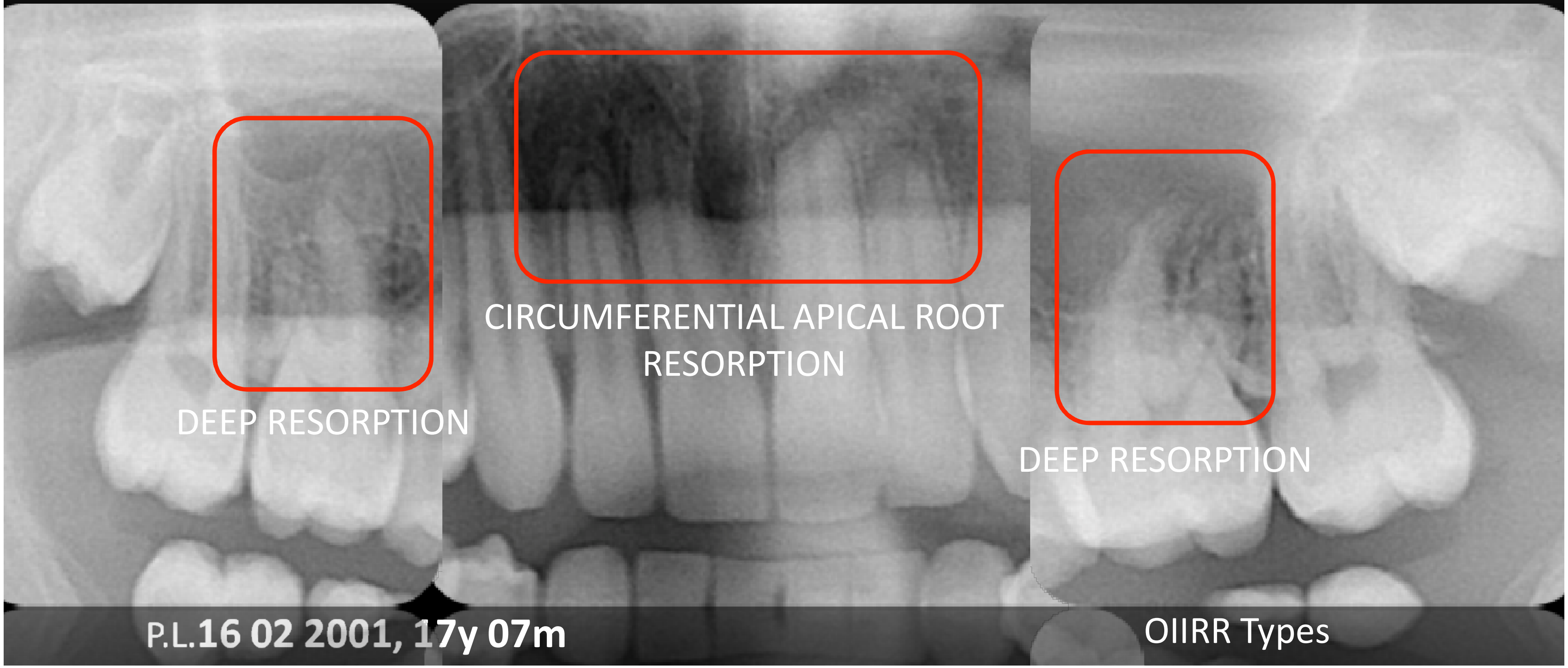
Sigla	Misura	UM	Norma	Diff...	Valutazioni	Normogramma
MISURE SCHELETRICHE ORIZZONTALI						
01 - SNA	79.2	°	82.0±2.0	-2.8	Retrusione del mascellare superiore	
02 - SNB	78.4	°	80.0±2.0	><	Normoposizione della mandibola	
03 - ANB	0.9	°	2.0±2.0	><	I classe scheletrica	
04 - A-N|FH	-5.3	mm	0.0±2.0	-5.3	Mascellare retruso	
05 - Po-N|FH	-8.8	mm	-4.0±2.0	-4.8	Mandibola retrusa	
06 - W	0.1	mm	-1.0±2.0	><	I classe scheletrica	
MISURE SCHELETRICHE VERTICALI						
07 - GoGn^...	27.4	°	32.0±3.0	-4.6	Ipodivergente	
08 - FMA	22.2	°	26.0±3.0	-3.8	Soggetto brachi-facciale	
09 - MM	22.5	°	28.0±3.0	-5.5	Ipodivergente	
MISURE RIFERITE AI DENTI ANTERIORI						
10 - Is-APo	6.0	mm	5.0±2.0	><	Normoinclinazione incisivi sup.	
11 - Ii-APo	3.2	mm	2.0±2.0	><	Normoposizione incisivi inf.	
12 - Is^MAX	114.6	°	110.0±5.0	><	Normoind. incisivi sup.	
13 - Ii^MAND	96.8	°	95.0±3.0	><	Normoind. incisivo inf.	

P.L.16 02 2001, 17y 07m

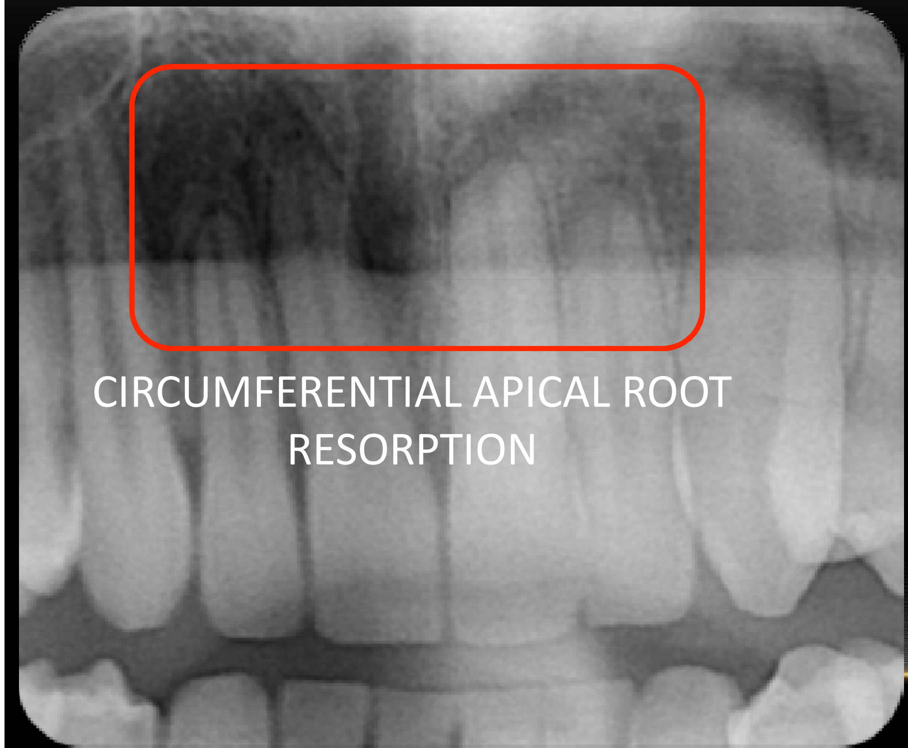
McLaughlin Analysis

Final Records

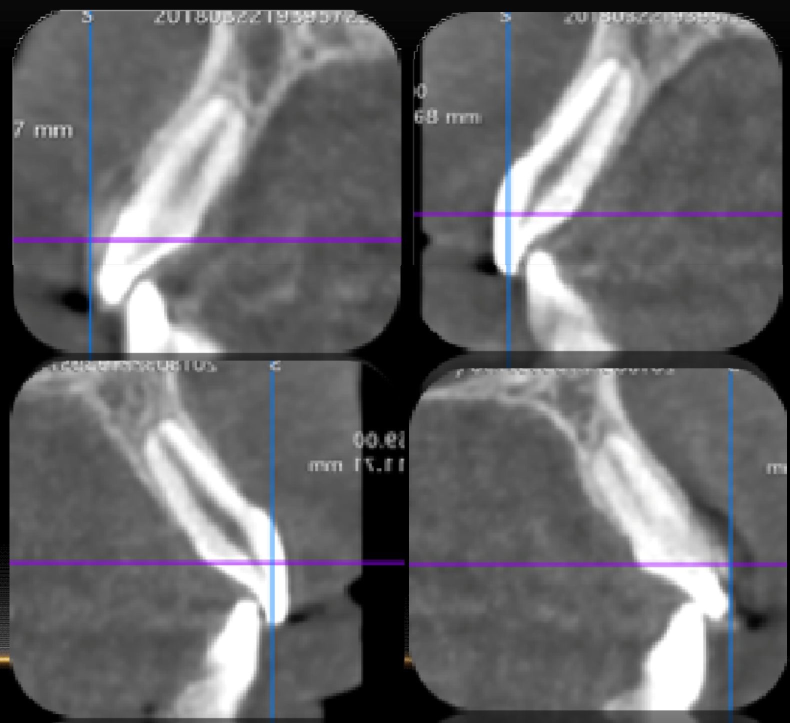
Orthodontically Induced Inflammatory Root Resorption (OIIRR) in a case of upper molars distalization with a tooth borne appliance



Orthodontically Induced Inflammatory Root Resorption (OIIRR) in a case of upper molars distalization with a tooth borne appliance

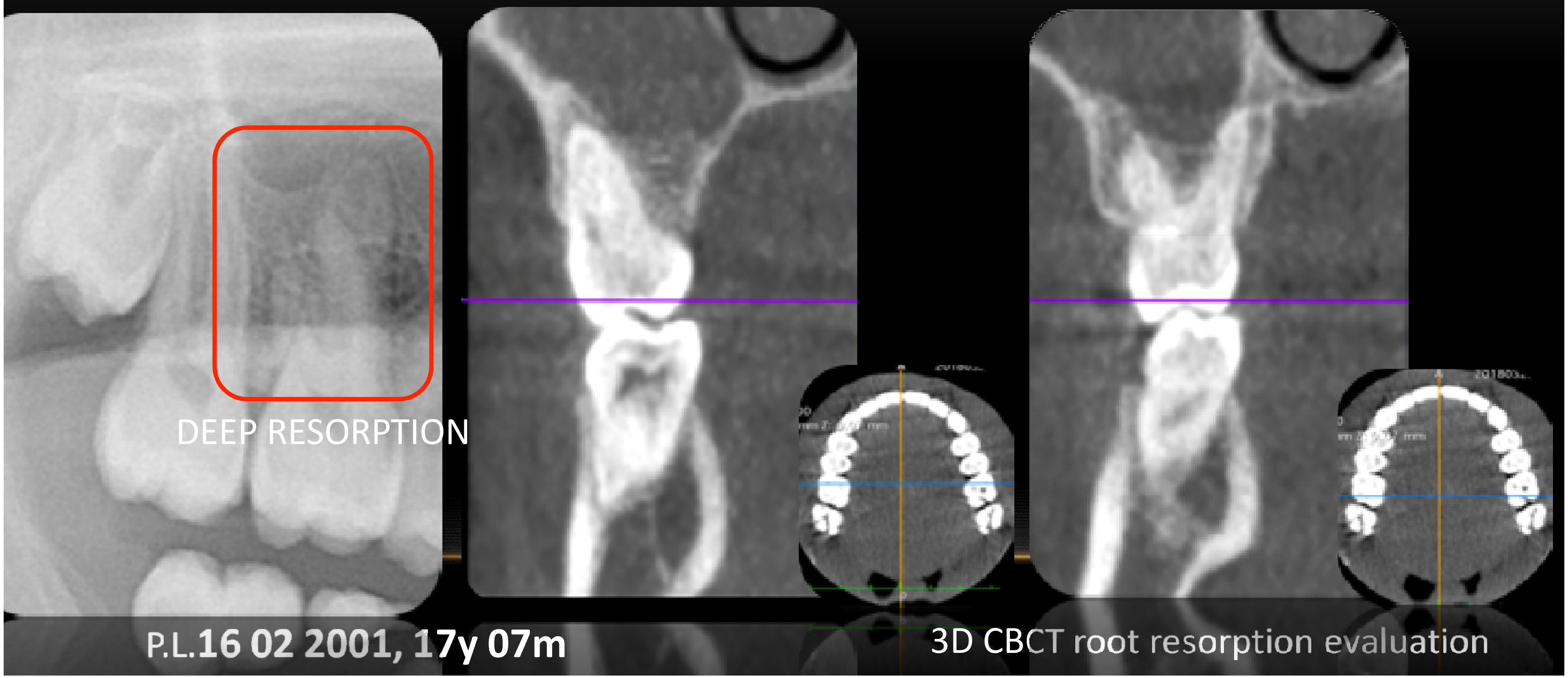


P.L.**16 02 2001, 17y 07m**

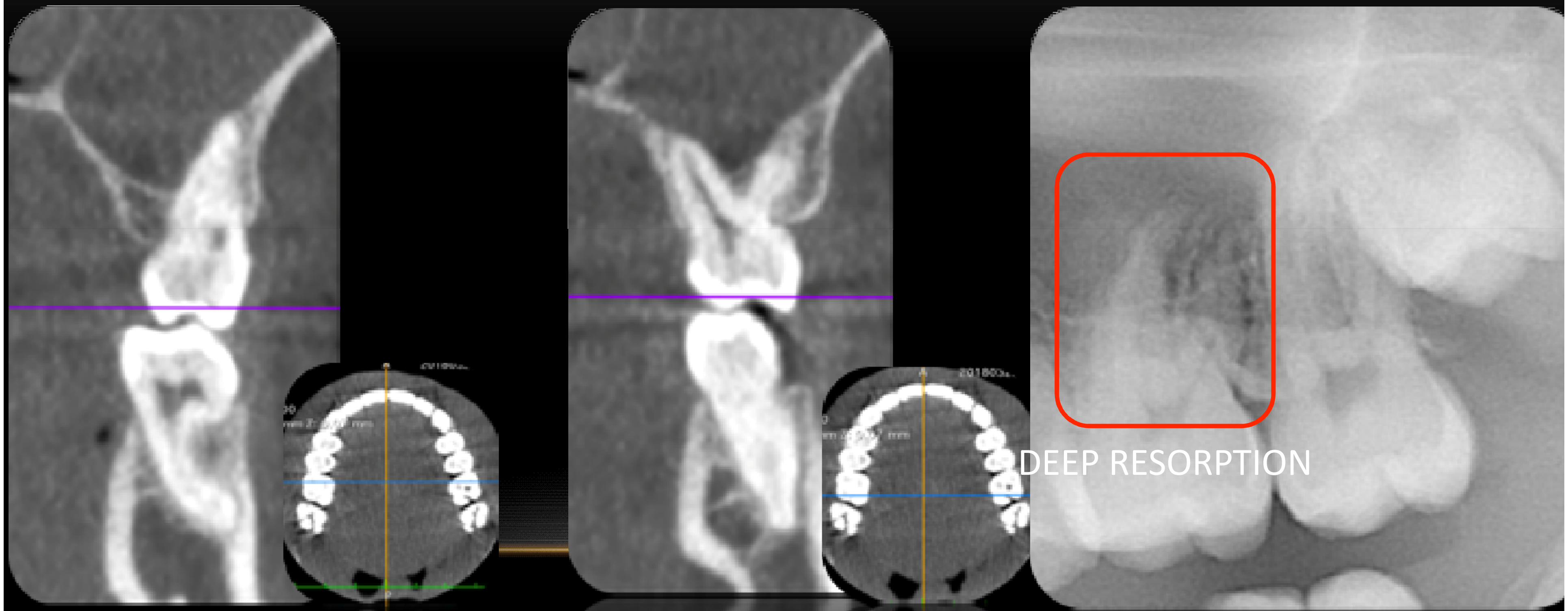


3D CBCT root resorption evaluation

Orthodontically Induced Inflammatory Root Resorption (OIIRR) in a case of upper molars distalization with a tooth borne appliance



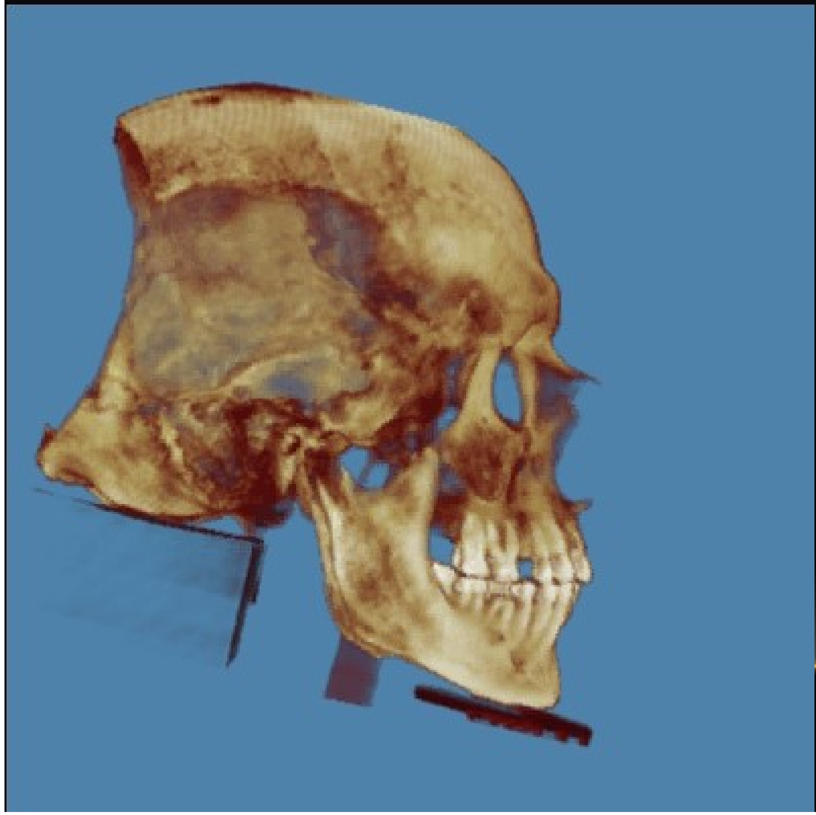
Orthodontically Induced Inflammatory Root Resorption (OIIRR) in a case of upper molars distalization with a tooth borne appliance

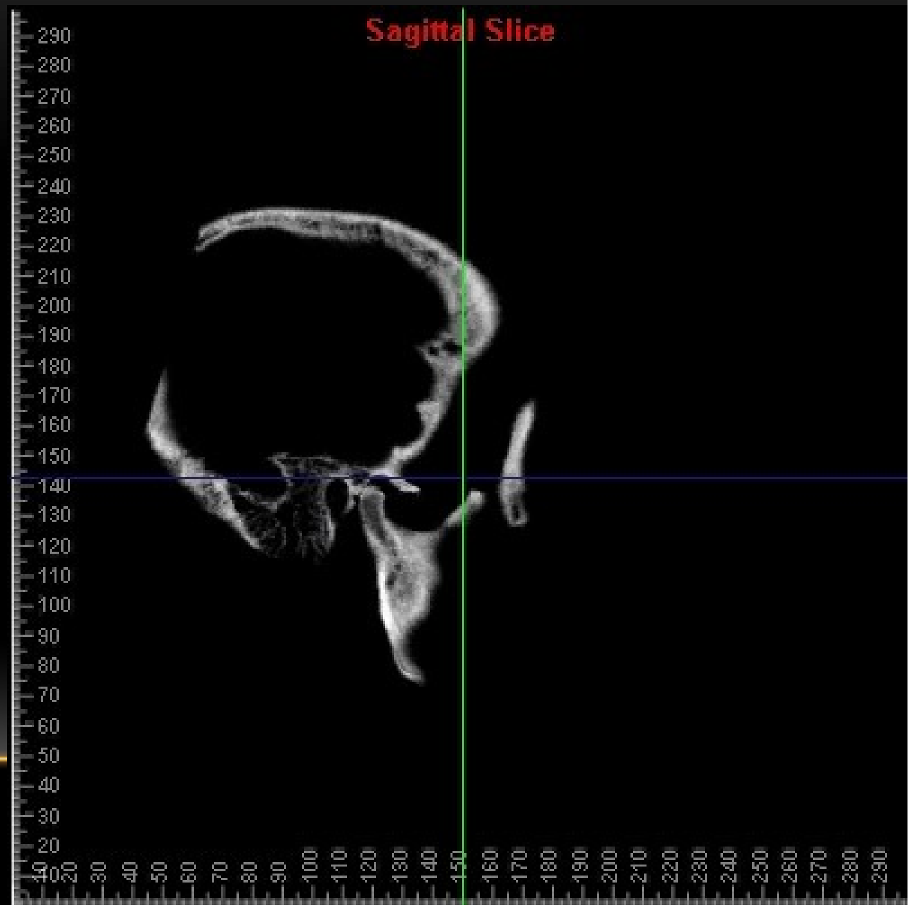


P.L.**16 02 2001, 17y 07m**

3D CBCT root resorption evaluation

OPI 90





SCIENTIFIC REPORTS

OPEN

Distinct growth of the nasomaxillary complex in *Au. sediba*

Received: 08 June 2015
Accepted: 18 September 2015
Published: 15 October 2015

Rodrigo S. Lacruz[1], Timothy G. Bromage[1,2], Paul O'Higgins[3], Viviana Toro-Ibacache[3,4], Johanna Warshaw[1] & Lee R. Berger[5]

Studies of facial ontogeny in immature hominins have contributed significantly to understanding the evolution of human growth and development. The recently discovered hominin species *Autralopithecus sediba* is represented by a well-preserved and nearly complete facial skeleton of a juvenile (MH1) which shows a derived facial anatomy. We examined MH1 using high radiation synchrotron to interpret features of the oronasal complex pertinent to facial growth. We also analyzed bone surface microanatomy to identify and map fields of bone deposition and bone resorption, which affect the development of the facial skeleton. The oronasal anatomy (premaxilla-palate-vomer architecture) is similar to other *Australopithecus* species. However surface growth remodeling of the midface (nasomaxillary complex) differs markedly from *Australopithecus*, *Paranthropus*, early *Homo* and from KNM-WT 15000 (*H. erectus/ergaster*) showing a distinct distribution of vertically disposed alternating depository and resorptive fields in relation to anterior dental roots and the subnasal region. The ontogeny of the MH1 midface superficially resembles some *H. sapiens* in the distribution of remodeling fields. The facial growth of MH1 appears unique among early hominins representing an evolutionary modification in facial ontogeny at 1.9 my, or to changes in masticatory system loading associated with diet.

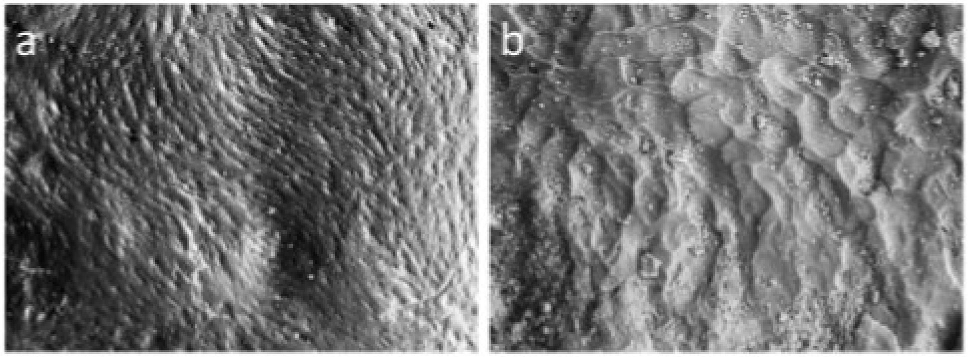


Figure 1. Electron micrographs of bone microanatomical features. Scanning electron micrographs of bone deposition (a) and resorption (b) from high-resolution replicas made of the MH1 face.

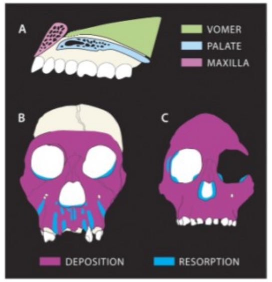


Figure 2. Facial characteristics of MH1. (a) Diagrammatic representation of the individual components of the intranasal region of MH1 based on synchrotron data (See also Figs S3 and S4). A step-like (similar to continuous-discrete classification of ref. 4) relationship between premaxilla and nasal cavity floor can be identified in MH1 as well as a lack of contact of the premaxilla with the vomer. (b) Reconstructed facial growth remodeling map of the face of MH1. Bone deposition is indicated by magenta whereas bone resorption is indicated in blue. Resorption can be observed along various portions of the lower face most predominantly along the alveolar region. (c) Reconstructed facial map of *Australopithecus* (*Au. afarensis* + *Au. africanus*) superimposed on Taung's face (reproduced from ref. 12) based on the analysis of the sub-adult specimens LH 2, AL 333-105, LH 21, Sts 2, Stw 59, Taung, Sts 24, Sts 57, MLD 2 and Sts 52. Drawing of skull in b) by the authors from original photographs. Skull on c) drawn by the authors with permission from TGB.

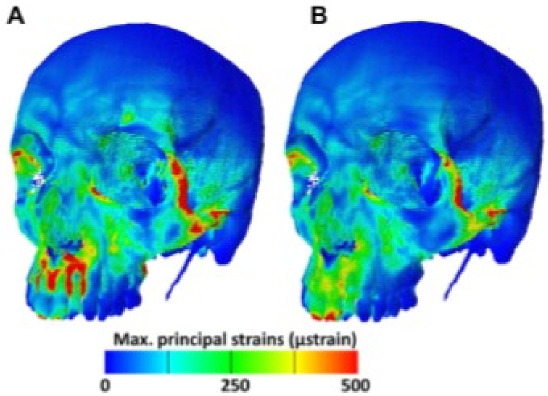


Figure 3. Simulated strain in a human skull. (a) Contour map of the maximum principal strains arising from simulated incisor biting in a human. Note the regions of high strain between the incisors and between I^2 and the canine. (b) The high strains noted between the anterior dentition in a) are absent or much reduced when teeth are allocated the same material properties as bone.

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PLOS | ONE

Facial Morphogenesis of the Earliest Europeans

Rodrigo S. Lacruz[1]*, José María Bermúdez de Castro[2], María Martinón-Torres[2], Paul O'Higgins[3], Michael L. Paine[1], Eudald Carbonell[4], Juan Luis Arsuaga[5], Timothy G. Bromage[6]

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Abstract

The modern human face differs from that of our early ancestors in that the facial profile is relatively retracted (orthognathic). This change in facial profile is associated with a characteristic spatial distribution of bone deposition and resorption: growth remodeling. For humans, surface resorption commonly dominates on anteriorly-facing areas of the subnasal region of the maxilla and mandible during development. We mapped the distribution of facial growth remodeling activities on the 900–800 ky maxilla ATD6-69 assigned to *H. antecessor*, and on the 1.5 My cranium KNM-WT 15000, part of an associated skeleton assigned to African *H. erectus*. We show that, as in *H. sapiens*, *H. antecessor* shows bone resorption over most of the subnasal region. This pattern contrasts with that seen in KNM-WT 15000 where evidence of bone deposition, not resorption, was identified. KNM-WT 15000 is similar to *Australopithecus* and the extant African apes in this localized area of bone deposition. These new data point to diversity of patterns of facial growth in fossil *Homo*. The similarities in facial growth in *H. antecessor* and *H. sapiens* suggest that one key developmental change responsible for the characteristic facial morphology of modern humans can be traced back at least to *H. antecessor*.

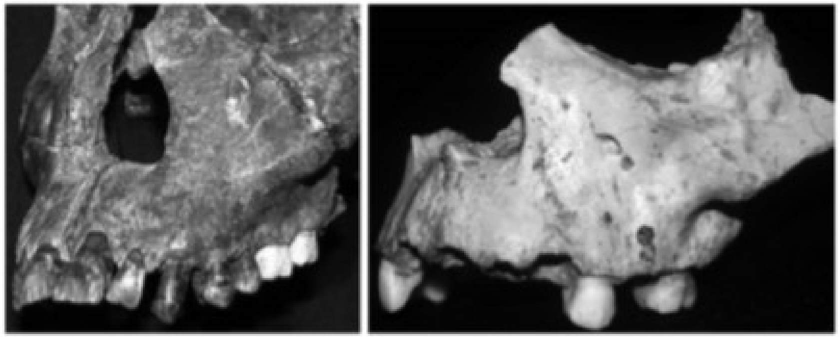


Figure 1. Lateral views of KNM-WT 15000 (left) and ATD6-69 (right). Note the differences in facial projection and in the topography of the maxilla.

doi:10.1371/journal.pone.0065199.g001

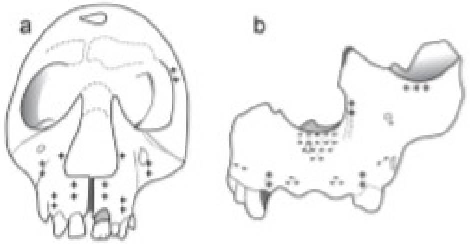


Figure 2. Facial growth remodelling maps. (A) Facial growth remodelling of the *H. erectus* specimen KNM-WT 15000 from Kenya, dating from ~1.5 my showing depository fields (+) over most aspects of the anteriorly facing maxilla. Taphonomic alterations prevented a more complete analysis of the periosteal surface of this specimen which was only studied by SEM. **(B)** Facial growth remodelling of the specimen ATD6-69 representing *H. antecessor*, the oldest known European hominin species dating to 900–800 ky. SEM and confocal microscopy data showed resorptive fields (−) throughout the naso-alveolar clivus of this hominin, a characteristic shared with *H. sapiens*. Gray circles indicate the areas spot-mapped using the portable confocal microscope (PCSOM).

doi:10.1371/journal.pone.0065199.g002

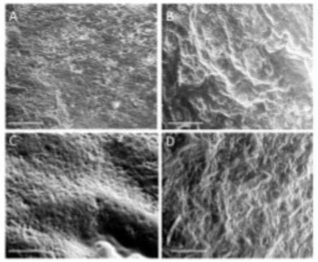


Figure 3. Scanning Electron Micrographs of facial growth remodeling in KNM-WT 15000 and ATD6-69. Images "**A**" and "**B**" are representative of growth remodeling fields in KNM-WT 15000 (*H. erectus*). Image "**A**" shows depository fields in the clivus area of this specimen. For comparison, "**B**" shows resorptive fields in the anterior aspect of the mandibular ramus of this specimen. Scale bars (A, B) = 50 µm. Images "**C**" and "**D**" represent growth remodeling fields of the specimen ATD6-69 (*H. antecessor*). Image "**C**" shows depository fields near the zygomatic region whereas "**D**" is a representative resorptive field in the clivus of ATD6-69. Scale bars (C,D) = 100 µm. All images shown here are taken from high resolution replicas examined in the scanning electron microscope.

doi:10.1371/journal.pone.0065199.g003

anterior portion of the zygomatic were characterized by depository fields. *Remaining maxilla*: Aspects of the maxilla such as portions of the anterolateral maxilla and canine fossa showed resorptive characteristics, whereas islets of depository fields were identified over the canine prominence.

2D 3D TRANSITION

Diagnosis

3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

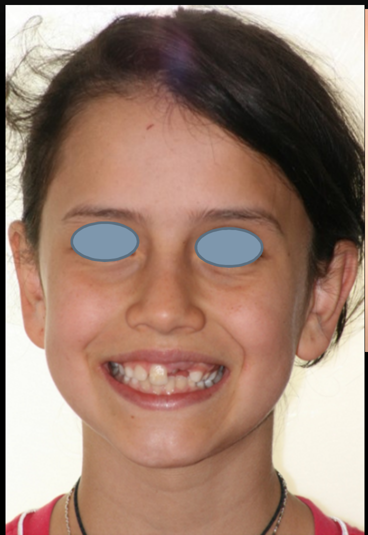
Treatment

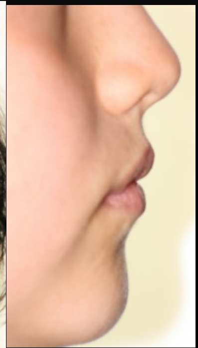
2D Treatment/3D VTO/3D Clincheck/ 13 23 Impaction 21 Severe Rotation 22 Root Resorption 3D Treatment

Appliances

ModifiedRPE/FixedAppliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Surgical Splint/IDB V2

CLINICAL CASE: THE PATIENT COMES TO OUR OBSERVATION, IN THE ORTHODONTICS DEPARTMENT OF THE UNIVERSITY CLINIC OF CHIETI, AT THE AGE OF 11 YEARS. SHE REPORTS THAT SHE FELL OFF HER BICYCLE AT AGE 5 AND HIT THE LEFT SIDE OF THE JAW ON THE HANDLEBAR. TO NOTE: THE ASYMMETRY OF EXCHANGE, THE ROTATION OF THE ELEMENT 21, 90 ° ON ITS AXIS, THE RISK OF INCLUSION OF 13 AND 23, THE BAD POSITION OF 22, WHICH IS EXTENDED AND ON ITS ROOT IS LOCATED THE CROWN OF 23, WHICH TENDS TO TRANSPOSE



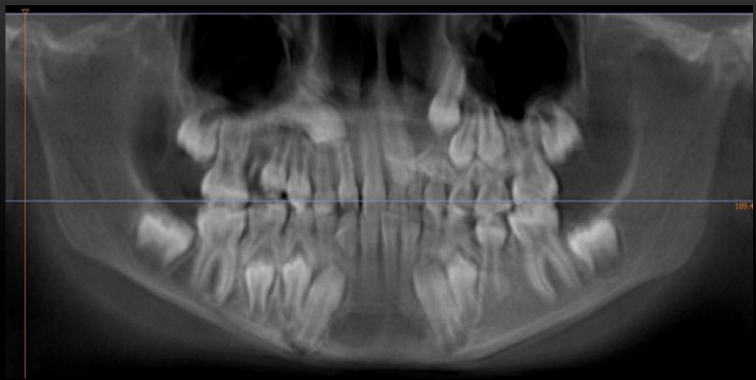


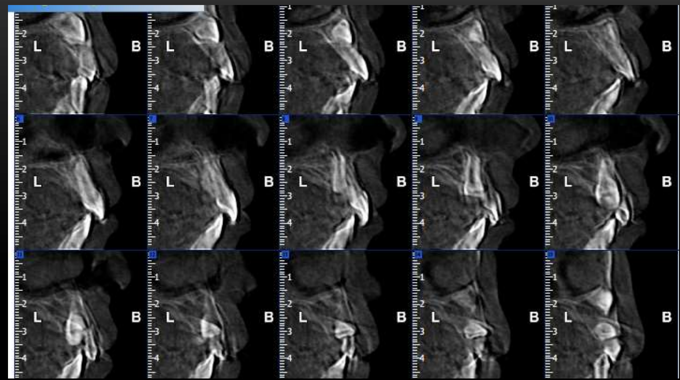
The median line is curved and deviated towards the left

Second class right molar ratio

First class left molar ratio

Clinical case treated by Dr.ssa Manuela Di Pilla

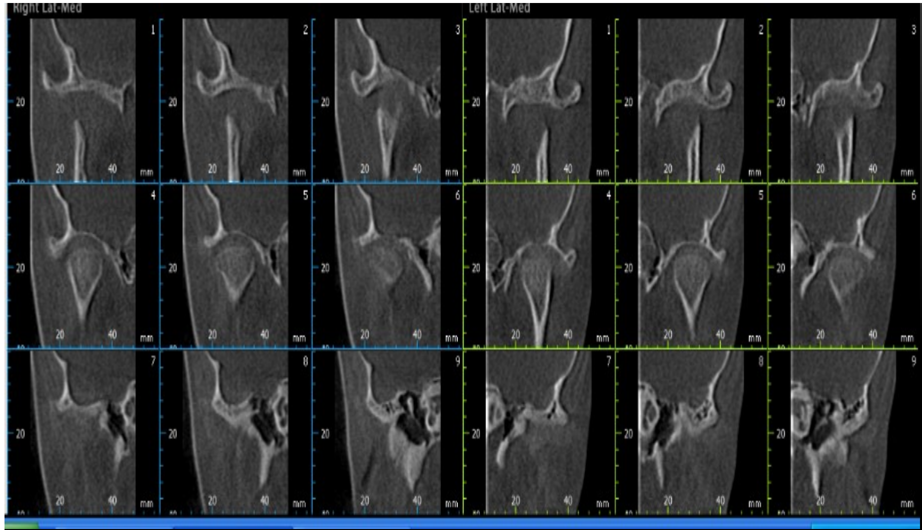




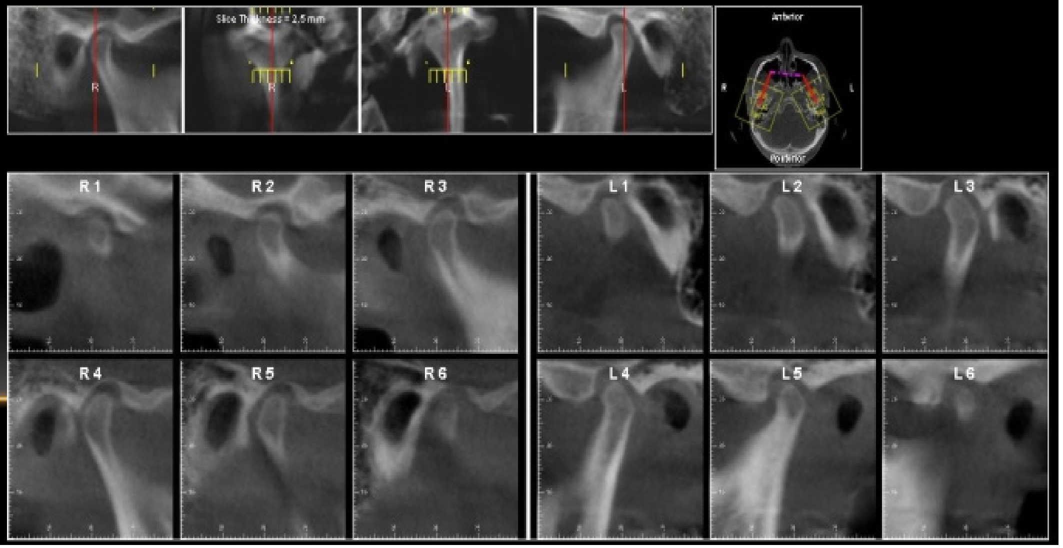
Normodivergente subject
Second skeletal class caused by a posterior mandible
Proclinated upper and lower incisors
OVJ 3mm
OVB 2mm

Initial cephalometric values

GoGn- SN	37°	32+-5	ANG. INTERI
FMA	26°	22-28 M	ANG. SELLA
MM	25°	28+-6	ANG.ARTICO
SNA	81°	82+-2	ANG. GONIA SUP INF
SNB	75°	80+-2	+1 A Pog -1 A Pog
ANB	6°	2+-2	WITTTS RIC WITTS REAL
+I Sna-Snp +I PFH +I SN	111° 112° 100°	113+-2 B 113+-1 B 103+-2	A –MC NAM Pog-MC NA
IMPA	96°	90-96 B	

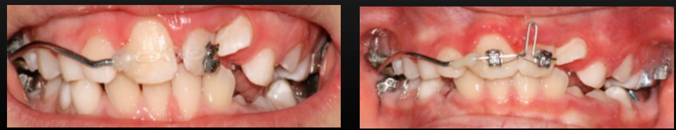


Posterior and curved condyles



Two months after the first visit

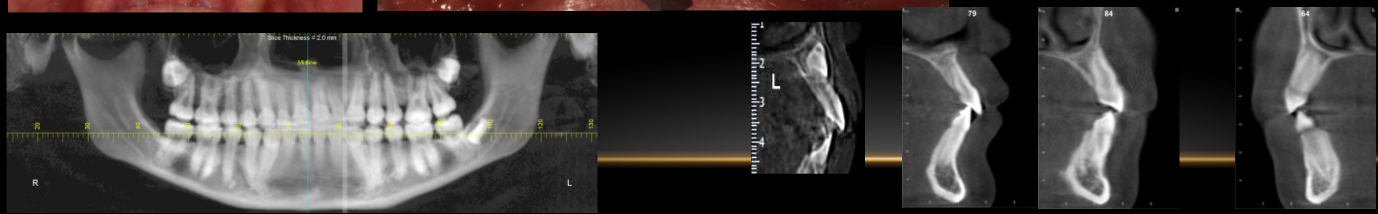
First Rapid expander of the palate with right vestibular arm to favor the derotation of 21



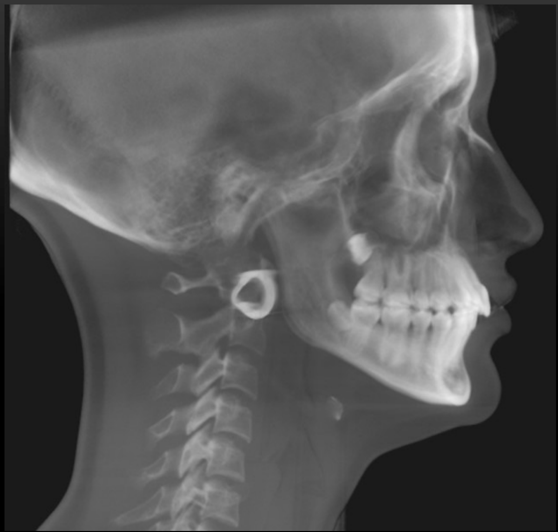
Second Rapid expander of the palate modified with two vastibolary right and left arms to bring in arch 13 and 23

Self ligating and coil brackets to increase the space for 22 and 23 in the arch and use of overlay to reposition these elements in the arch

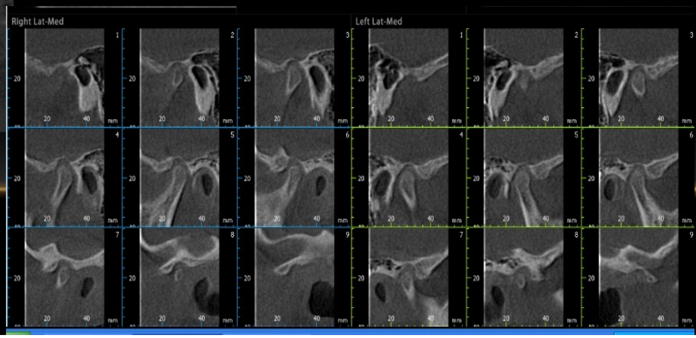
Final photos of the case

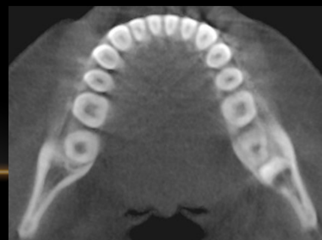


A slight second class on the right remains, the medians are centered the arches are well shaped, the teeth have not worsened their condition with respect to the cortical teeth, the condyles are more concentric in the glenoid cavities



GoGn- SN	31°	32+-5	ANG. INTERI	124°	132+-6
FMA	24°	22-28 M	ANG. SELLA	130°	122+-5
MM	21°	28+-6	ANG.ARTICO	130°	143+-6
SNA	83°	82+-2	ANG. GONIA SUP INF	132° 56° 76°	120+-5 50+-2 70+-3
SNB	79°	80+-2	+1 A Pog -1 A Pog	4mm 1mm	3,5+-2 2+-2
ANB	4°	2+-2	WITTTS RIC WITTS REAL	1mm	0+-2
+I Sna-Snp +I PFH +I SN	121° 119° 110°	113+-2 B 113+-1 B 103+-2	OB OJ	3mm 2mm	
IMPA	95°	90-96 B			





2D 3D TRANSITION

Diagnosis 3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

Treatment 2D Treatment/3D VTO/3D Clincheck/ 3D Treatment

Appliances Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Virtual Surgical Splint/ IDB V2

Genomic Anthropology applications to orthognatic surgery

PROF. G. IANNETTI
Dr. M. PAGNONI

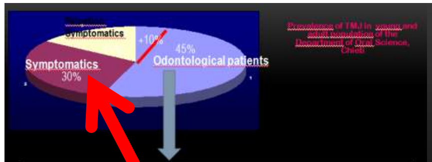


Table 1a. Prevalence of TMDs sig[illegible] symptoms (expressed as percentage, %, of subjects that showed the TMD's signs and symptoms in the group) in the [illegible] sample classified on the base of age. The chi-square analysis was employed to verify the existence of statistically significa[illegible] differences between the two groups.

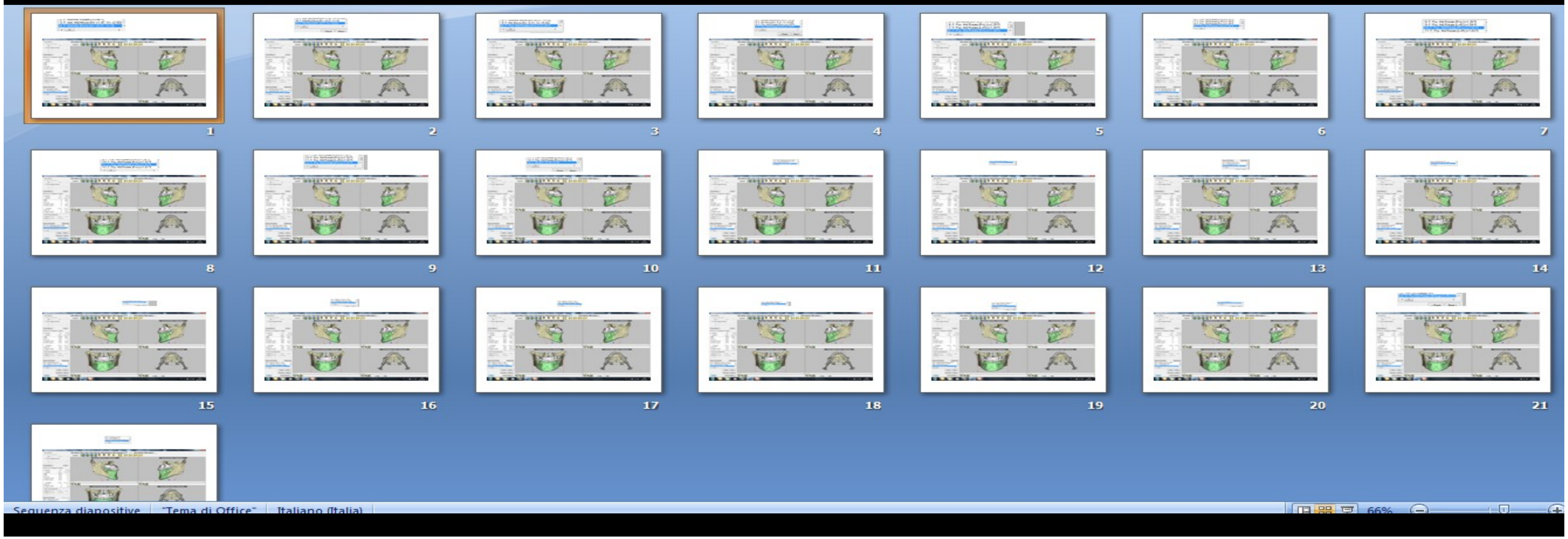
	5<age<11	12<age<18	χ^2	P
TMD's symptoms	22.58	28.21	.490	.484
Bruxism	13.31	11.54	.040	.841
TMJ's sounds	1.75	8.21	3.600	.058
Grinding	6.18	4.87	.091	.763
Deviation during opening	1.08	5.13	2.667	.102
Reduced movements of opening lateral protru[illegible]	0.27	2.82	1.000	.317
Myopain	5.11	14.10	4.263	.039*

Case 20 TMJ Extrarticular:Class III, severe Asymmetrical Long face syndrome, Passive Aligners + straight wire + virtual Splint + Orthognatic Surgery

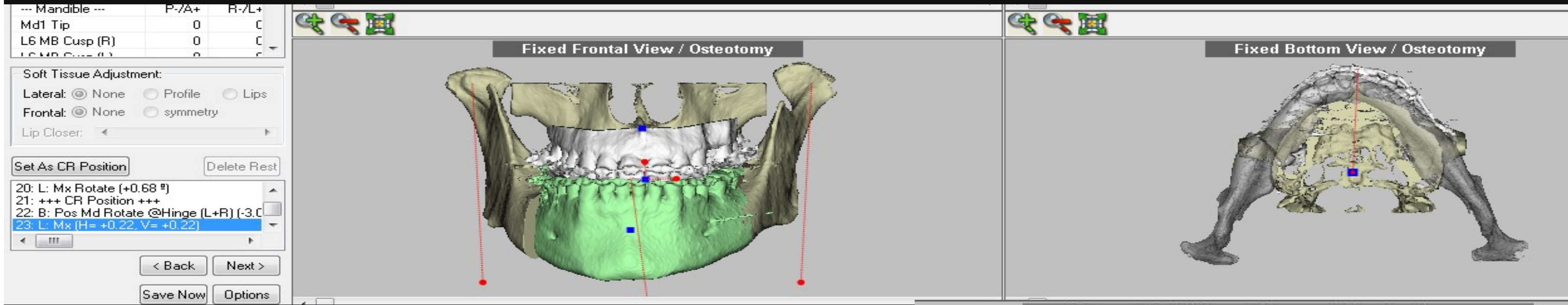
TMJ: Severe pain Temporalis Tendon L, Right Upper Trapezius

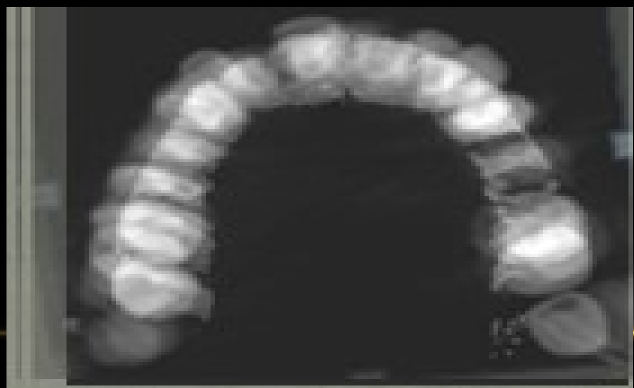
Age:23 years 2 Months Passive Aligners 6 Months low-friction 12 Months retention Passive Aligners

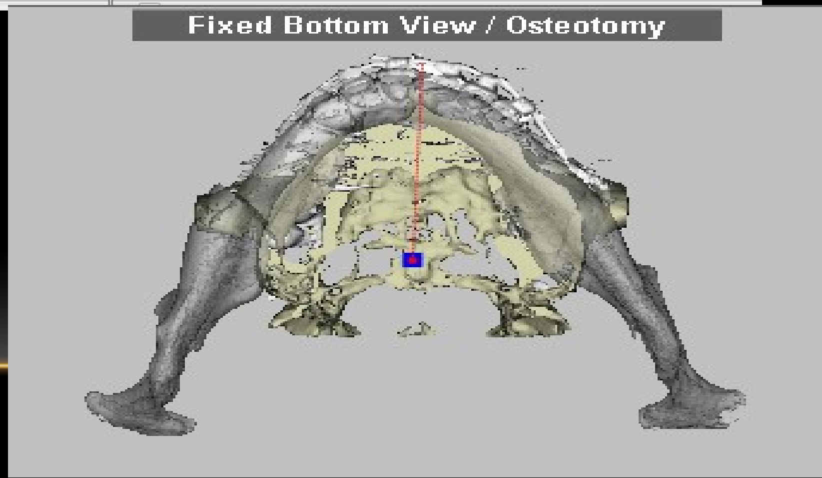
Surgical VTO for Virtual splint Upper (mandibular traslation) and Lower (Maxillary traslation) needed 29 VTO microadjustments to adapt maxillo-mandibular asymmetry



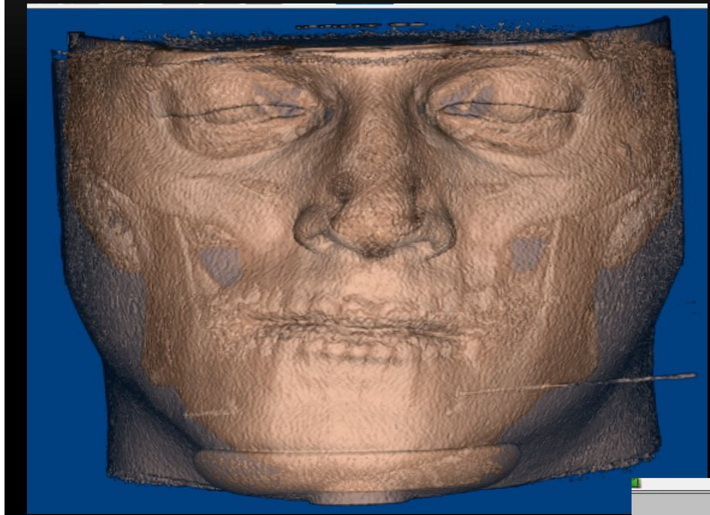
DOLPHIN 3D VTO > OPI

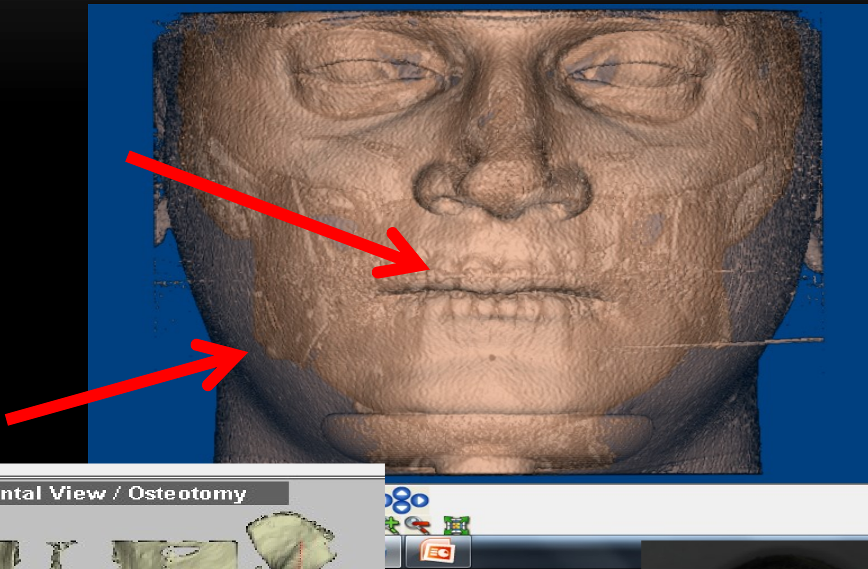


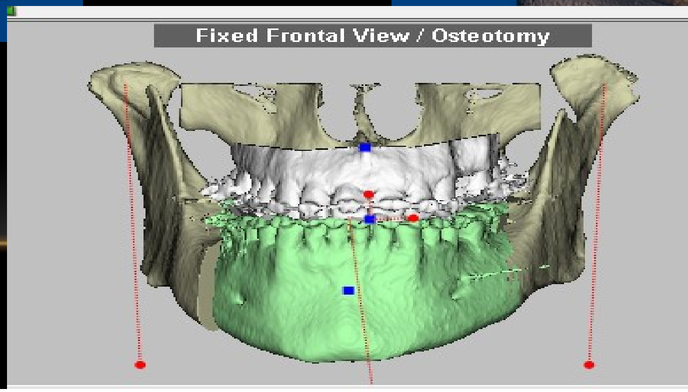


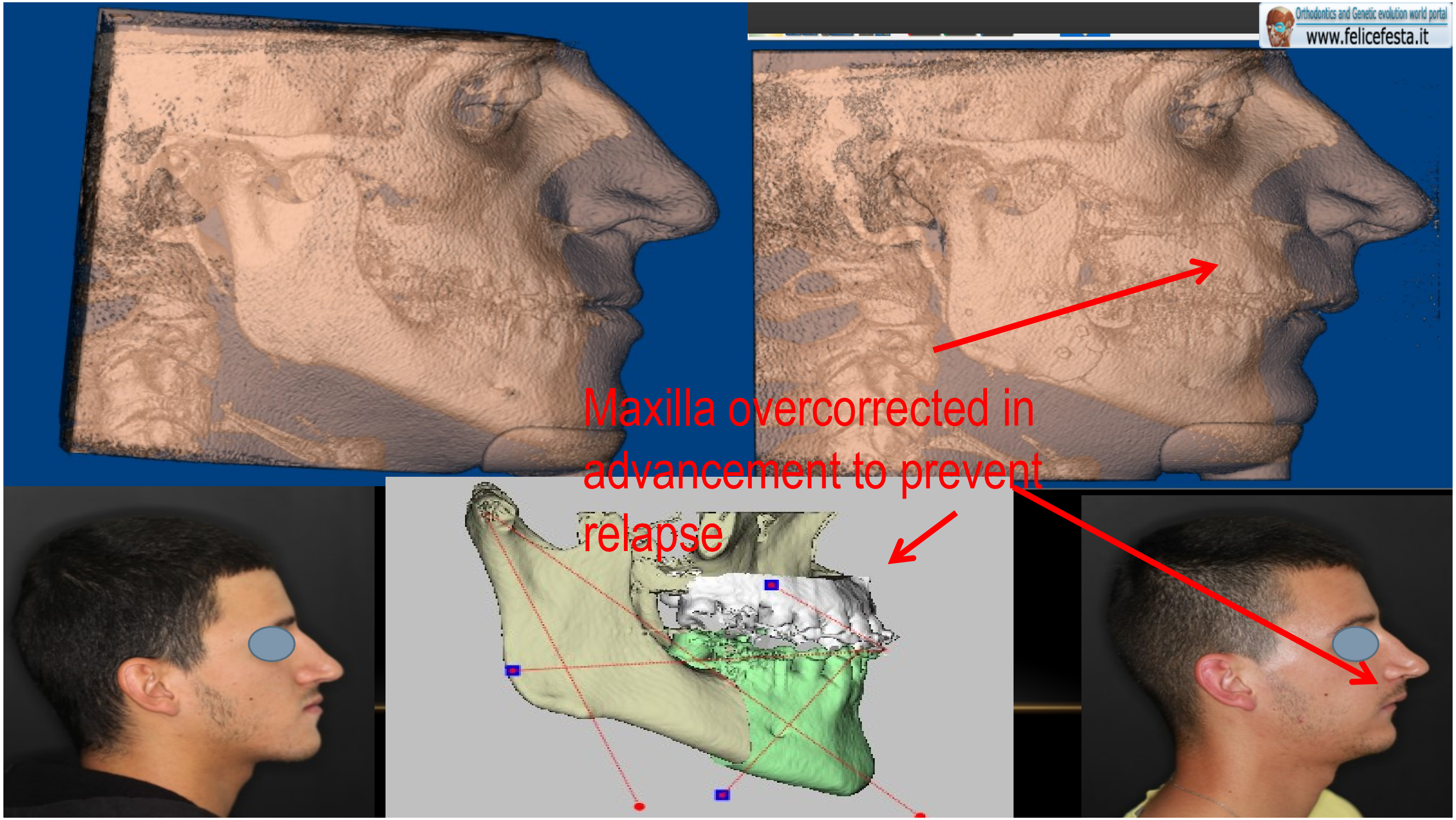


ORTHOGNATIC SURGERY PERFORMED FROM PROF. G. IANNETTI AND DR. MARIO PAGNONI

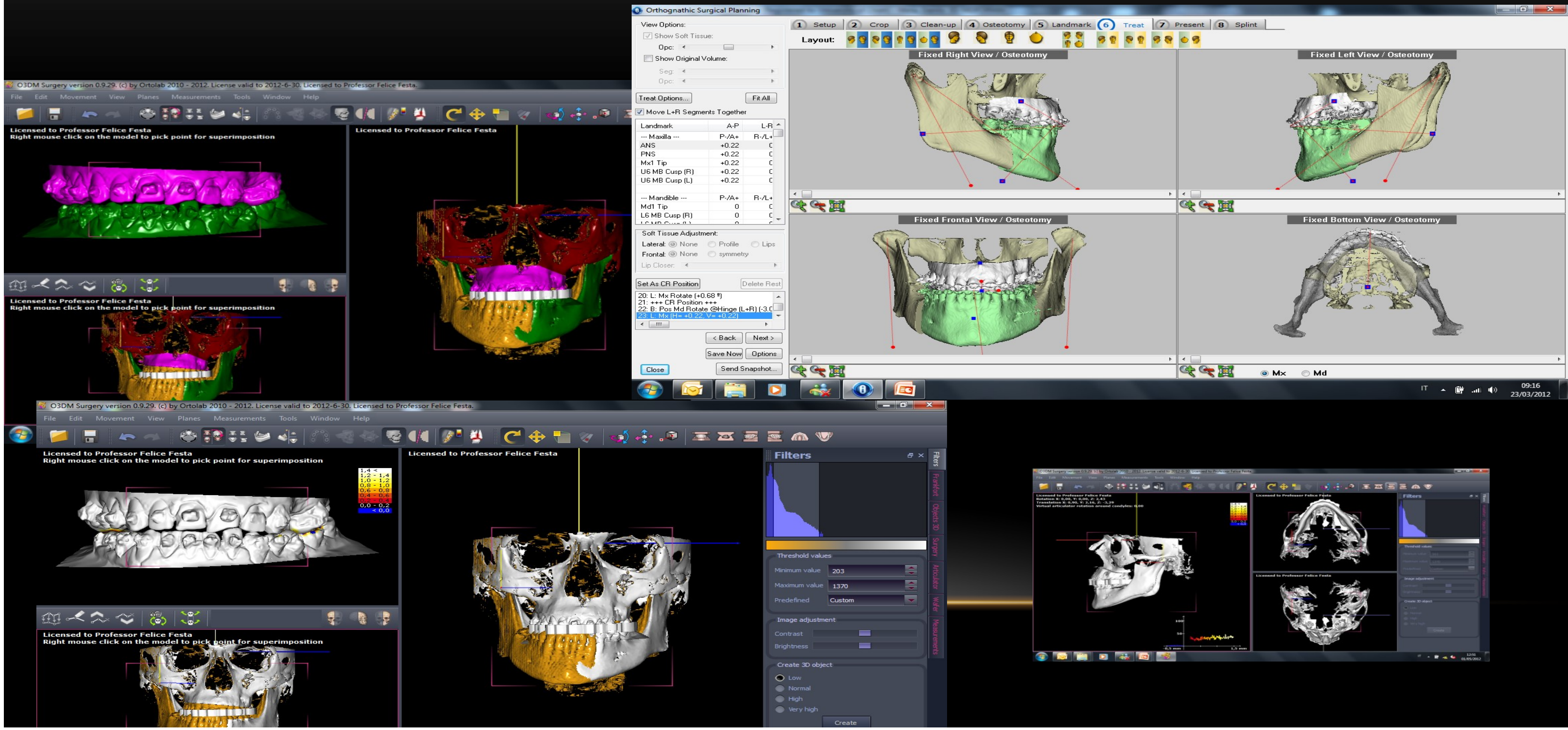




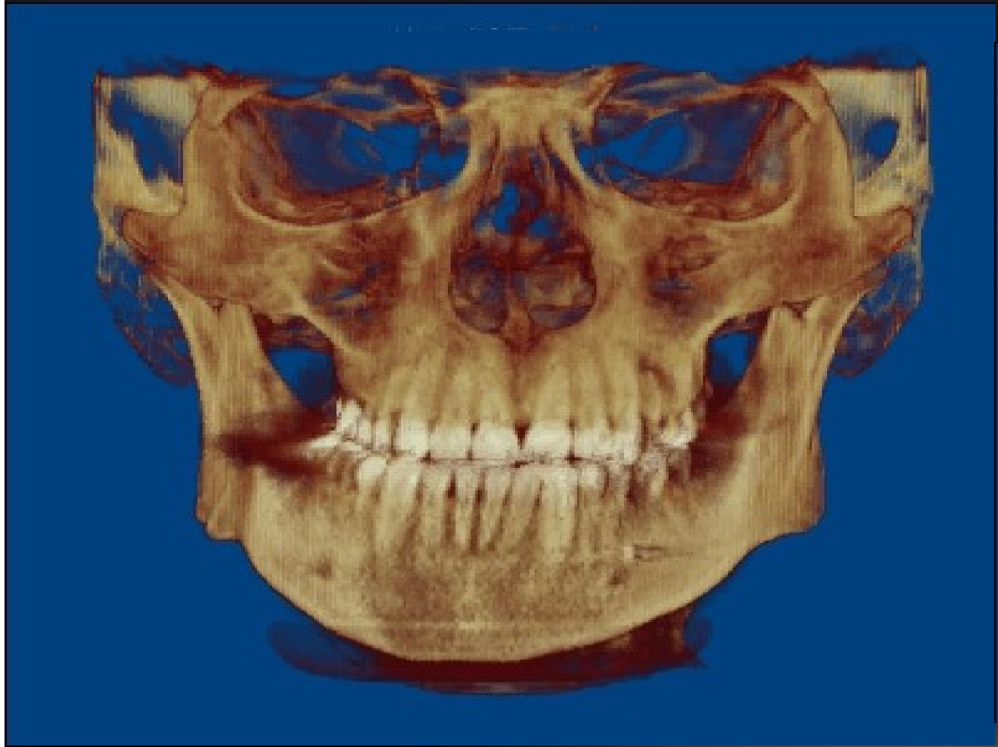



Orthodontics and Genetic evolution world portal
www.felicefesta.it
Maxilla overcorrected in advancement to prevent relapse

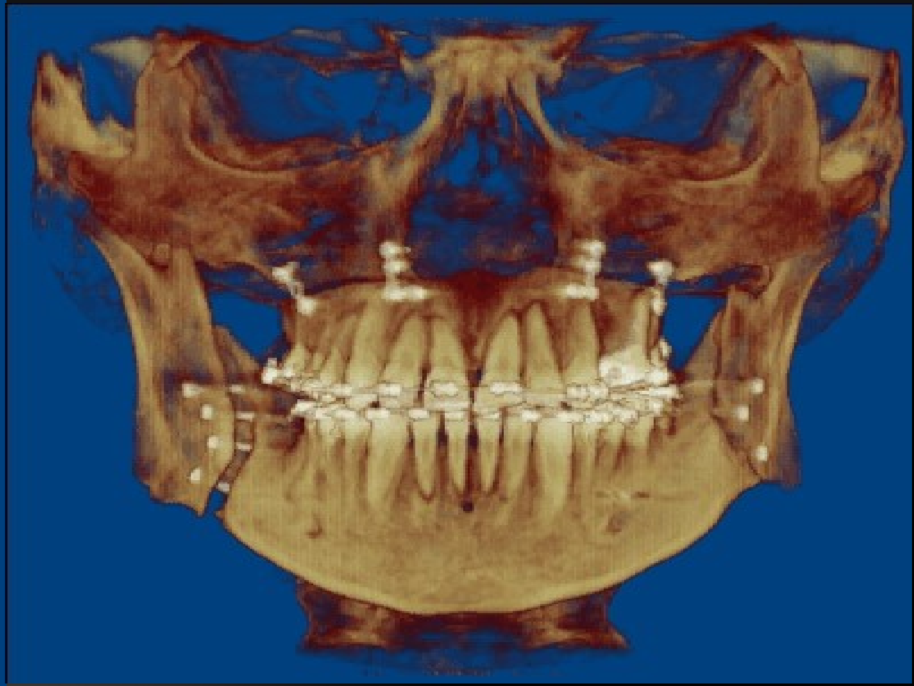
O3DM SOFTWARE (PL)+DOLPHIN BETA VERSION TO REALIZE VIRTUAL SPLINTS



BEFORE



AFTER



2D 3D TRANSITION

Diagnosis

3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

Treatment

2D Treatment/3D VTO/3D Clincheck/ 3D Treatment/3D Upper Airway/Orbital Volume Reconstruction

Appliances

Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Virtual Surgical Splint/ IDB V2 http://www.editorialmanager.com/scs/default.a | (1) journal craniofacial surgery ... | Information for Authors : Jour... | Editorial Manager®

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Submissions with an Editorial Office Decision for Author Felice Festa, Ph.D., M.D.

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Page: 1 of 1 (2 total completed submissions) Display 10 results per page.

Journal of Craniofacial Surgery

Orbital volume and surface after Le Fort III advancement in syndromic craniosynostosis Short Title: Orbital volume volume and Le Fort III

--Manuscript Draft--

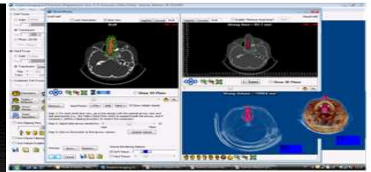
Manuscript Number:	SCS-11-45R3
Full Title:	Orbital volume and surface after Le Fort III advancement in syndromic craniosynostosis Short Title: Orbital volume volume and Le Fort III
Short Title:	Orbital volume and le Fort III
Article Type:	Original Article
Keywords:	syndromic synostosis, orbital volume, midface advancement, distraction osteogenesis, Le Fort III osteotomy
Corresponding Author:	Felice Festa, Ph.D., M.D. Chieti-Pescara "G. d'Annunzio" University Chieti Scalo, Chieti ITALY
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	Chieti-Pescara "G. d'Annunzio" University
Corresponding Author's Secondary Institution:	
First Author:	Felice Festa, Ph.D., M.D.

VOLUMETRIC EVALUATION OF

THE PURPOSE OF THE STUDY

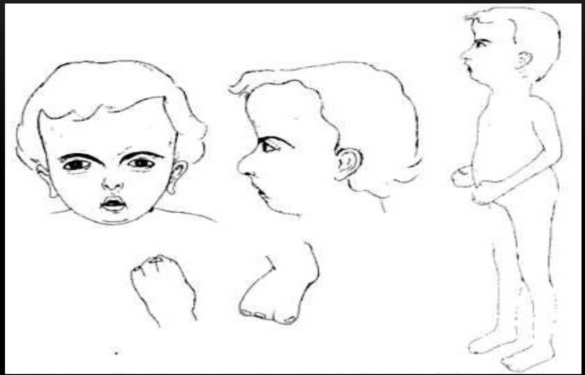
Purpose of this study is to determine the changes in airway space volumes through 3D-CT images before and after Le Fort III advancement in 4 Caucasian subjects affected by craniofacial syndromic malformations

For the inferior limit of the upper airway space, in order to standardize the measurements in all the subjects, the line between the posterior nasal spine and the Basion point was considered (pns-Ba line).



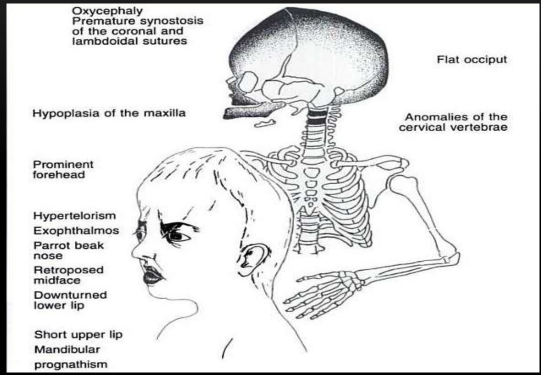
We only considered the upper airway volume, because the lower airway space is different from the upper, in having no rigid support, instead being muscle and ligament formed and supported, as muscle tensions keep the lumen patent.

Apert syndrome



- Mutation of the FGFR2 gene (10q25-q26)
- Craniosynostosis of the coronal suture.
- Birth prevalence of about 1 per 65,000 live births
- Turricephaly
- Exophthalmos
- Skin or bone Syndactyly, may be partial or total
- Maxillary hypoplasia
- Possible mental retardation

Crouzon syndrome



- Mutation of the FGFR2 gene (10q25-q26)
- impairment of the bone with endochondral ossification .
- Turricephaly or oxycephaly with abnormal bulging of the bregma
- maxillary hypoplasia
- exophthalmos

J Craniofac Surg. 2015 Sep;26(6):1940-3. doi: 10.1097/SCS.0000000000001949.

Family of Crouzon Syndrome Represents the Evolution of the Frontofacial Monobloc Advancement Technique: From Immediate Movement to Monobloc Distraction to Monobloc Bipartition Distraction.

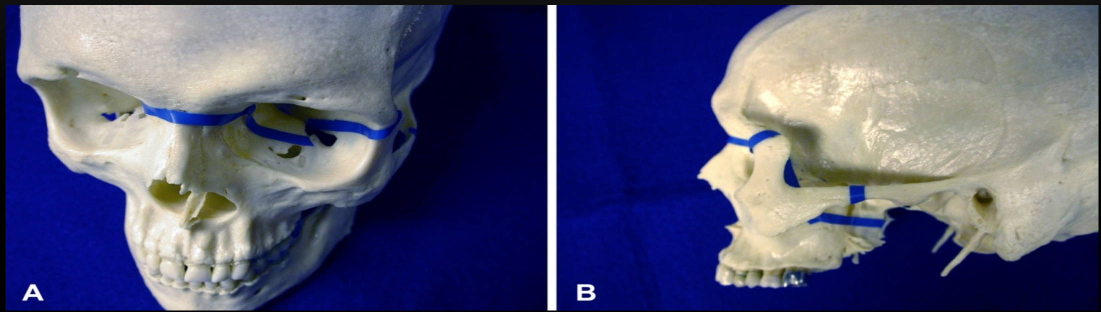
Raposo-Amaral CE[1], Denadai R, Ghizoni E, Buzzo CL, Raposo-Amaral CA.

Author information

Abstract

Crouzon syndrome (CS) is an autosomal dominant disorder characterized by premature fusion of cranial sutures, midface and supraorbital ridge retrusion, exorbitism, and in some clinical scenarios strabismus, parrot-beaked nose, short upper lip and hypertelorbitism. Treatment of CS is overlapped with the beginning of craniofacial surgery and is grounded on morphologic and functional objectives. The authors reported on the outcomes and complications of family members (mother and 2 siblings) with CS, who were operated on by different techniques of frontofacial advancement and have attained skeletal maturity. Operations were performed in different moments throughout the last 3 decades of craniofacial surgery history. A 10-year-old Crouzon progenitor underwent a monobloc osteotomy with acute advancement, using rigid fixation and bone grafting in the osteotomy sites. An 8-year-old Crouzon daughter underwent gradual lengthening of a monobloc segment, using an external, institutionally made distracter device. In addition, a 10-year-old Crouzon son underwent gradual lengthening of a monobloc segment associated to facial bipartition, using an internal distracter device. After 30 years, the mother presented a mild relapse on the orbit level, but her children had satisfactory stable outcomes. The family members with CS have undergone different modifications of the monobloc approach based on different chronological momentum, from acute monobloc advancement, to monobloc distraction, to monobloc facial bipartition distraction.

UPPER THIRD FACE SURGICAL ADVANCEMENT
LE FORT III



•Subperiosteal undermining allows exposure of the fronto-nasal and fronto-malar sutures

•The osteotomy line is then performed between these sutures, along the lateral wall of the orbit, reaching the inferior orbital fissure.

•The osteotomy line continues along the medial orbital wall behind the naso-lacrymal canal .

•The zygomatic body and arch are also interrupted medially or laterally, depending upon the preoperative planning .

•The osteotomy is then completed with the pterigo-maxillary disjunction.

• The mobilization of the maxillo-facial skeleton is achieved with the use of the Rowe

Thanks to prof. G.Iannetti for the surgical part of the study

Crouzon and Apert cases Surgery performed from Prof. G. Iannetti, Director Department of Maxillofacial Surgery "La Sapienza" University Rome ITALY

The original technique was characterized by a one-stage acute midface advancement, but it presented a limiting factor determined by the muscular and soft-tissue resistance. In order to overcome these limits, recently, a midface advancement with distraction osteogenesis has been proposed.

Thanks to prof. G. Iannetti for the surgical part of the study

The Rigid External Distractor (RED) is applied. The halo-type external fixation device of the RED is secured to the calvaria and connected, through anchored-bars, with plates at the inferior orbital rim and at the pyramidal apophysis of the upper maxilla, bilaterally.

Traction is initiated at a rate of 0.5 mm twice a day to achieve the desired advancement in the sagittal and vertical plane. After the distraction process is completed, a 2-3 months consolidation phase is required. After advancing the midface for at least 20 mm the occlusion was corrected from class III in class II with overcorrection in all patients

Thanks to prof. G. Iannetti for the surgical part of the study

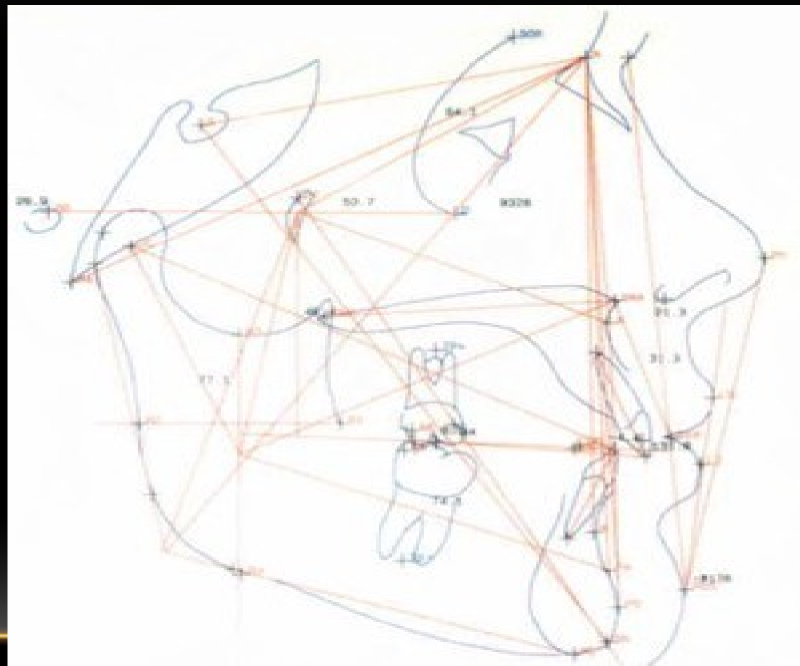
INCLUSION CRITERIA

- 12 subjects suffering from Apert and Crouzon syndrome were evaluated in the sample, 6 subjects suffering from Crouzon Syndrome and 6 from Apert Syndrome.
- Age was in a range from 5-9 y. old. In the sample there were 5 females and 7 males

Thus, to include the patients in this study we utilized some cephalometrical and clinical impair index, as gravity index; after this selection only 4 patients are eligible for the study.

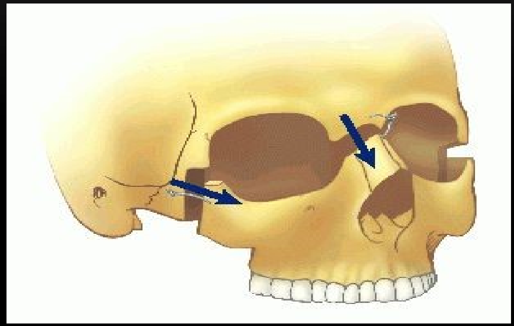
ALL SUBJECTS INCLUDED SHOWED:

- Frequent episodes of obstruptive sleep apnea (OSAS): Characterized by recurrent complete or partial obstruction of the upper airways, during sleep, deterioration of artery blood gas and increasing inspiratory effort to provide airway permanence .
- Class III malocclusion due to midface retrusion (ANB angl: 0°, A to N perpendicular - 3.0 mm, Pog to N perpendicular - 5.0 mm)



EXPERIMENTAL PROTOCOL

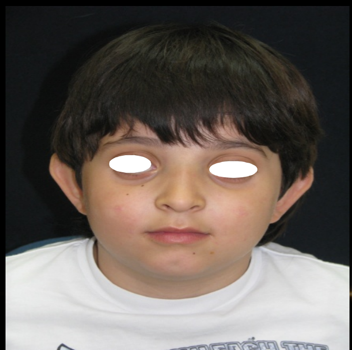
- The subjects were limited to those treated only with Le Fort III midface advancement, and all operations were performed by the same operator (Prof. G. Iannetti).
- The pre-operative (T0) and post-operative (T1: 6 months after surgery) 3D craniofacial CT scans of the subjects were collected and retrospectively analyzed.
- The airway space volume and orbital volume before and after treatment were analyzed and compared; also the airway surfaces and orbital surfaces on the axial, coronal, and sagittal CT scans were calculated and compared.
- Informed consent had been obtained from all subjects.

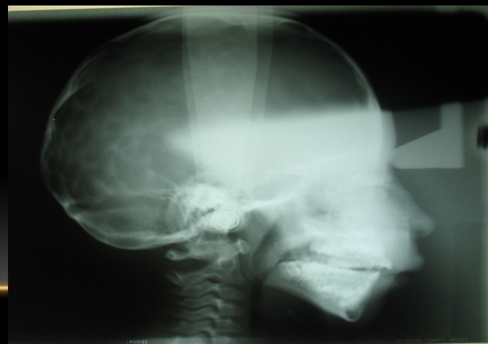


Patient affected by Crouzon syndrome pre-treatment photo

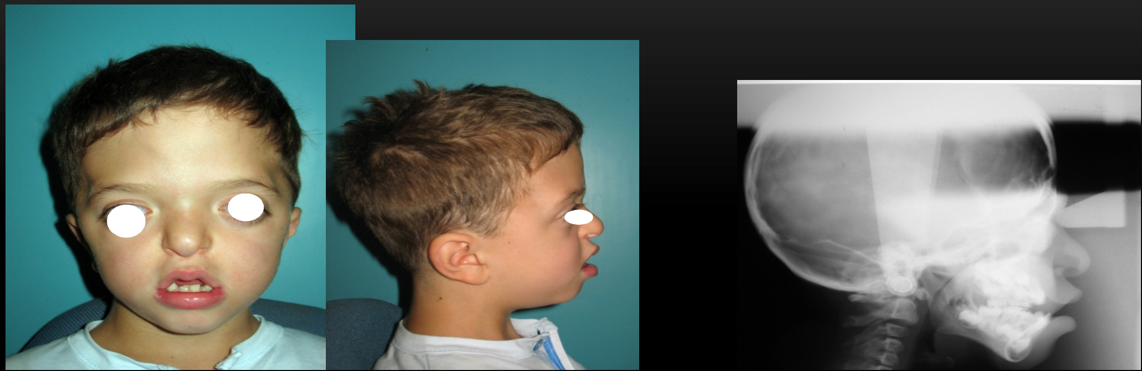


Patient affected by Crouzon syndrome post-treatment photo





Patient affected by Apert syndrome pre-treatment photo



Patient affected by Apert syndrome post-treatment photo

Studies on method error

- intra-observer method error

The mean differences between the first and the second measurements were 11.8 mm^3. In general, the contributions of errors to the total variance were small, from 0.094% for the volume.

$Ve = \Sigma (x_1 - x_2)^2 / 2N = 3{,}77$

- inter-observer method error

The mean differences between the first and the second operators were 12.7 mm^3

$Ve = \Sigma (x_1 - x_2)^2 / 2N = 4{,}34$

No significant difference was observed for the intra-observer and the inter-observer method error. These data confirmed the reproducibility of CT data.

Statistics

	Sagittal surface (mm^2) (T0-T1)	Coronal surface (mm^2) (T0-T1)	Assial surface (mm^2) (T0-T1)	Airway volume (mm^3) (T0-T1)
Z	-1,826	-1,826	-1,826	-1,826
Asymp. Sig. (2-tailed)	,068	,068	,068	,068

a Based on negative ranks.
b Wilcoxon Signed Ranks Test

THE UPPER AIRWAY SPACE VOLUME SIGNIFICANTLY INCREASED AFTER LE FORT III ADVANCEMENT.

Table 1. Descriptive Statistics

	N	Mean	SD	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
Sagittal surface (mm^2) T0	4	798,92	74,88	716,80	898,50	734,65	790,20	871,92
Coronal surface (mm^2) T0	4	226,75	62,85	147,50	301,30	167,62	229,10	283,52
assial surface (mm^2) (T0)	4	473,32	62,34	411,50	557,70	420,32	462,05	537,60
Airway Volume (mm^3) T0	4	9166,57	1861,48	7945,60	11920,00	7991,05	8400,35	11108,32
Sagittal surface (mm^2) T1	4	1151,45	218,47	846,40	1358,70	926,22	1200,35	1327,77
Coronal surface (mm^2) T1	4	390,42	102,21	318,70	542,10	326,62	350,45	494,20
Assial surface (mm^2) T1	4	676,00	151,07	532,60	865,60	544,22	652,90	830,87
Airway volume (mm^3) T1	4	15300,45	5114,09	9163,80	21667,80	10583,65	15185,10	20132,60

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Journal of Craniofacial Surgery

Orbital volume and surface after Le Fort III advancement in syndromic craniosynostosis Short Title: Orbital volume volume and Le Fort III

--Manuscript Draft--

Manuscript Number:	SCS-11-45R3
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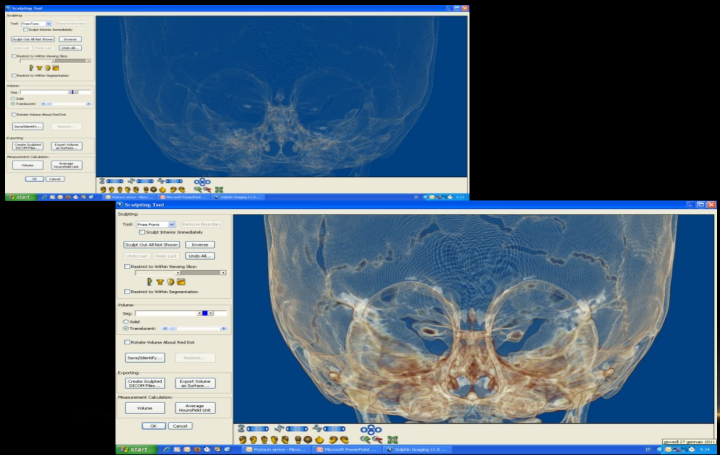
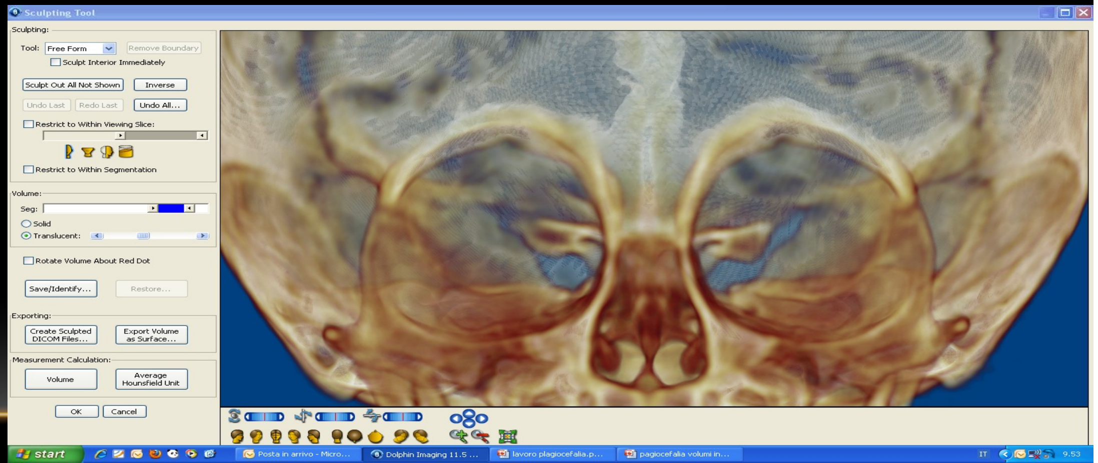
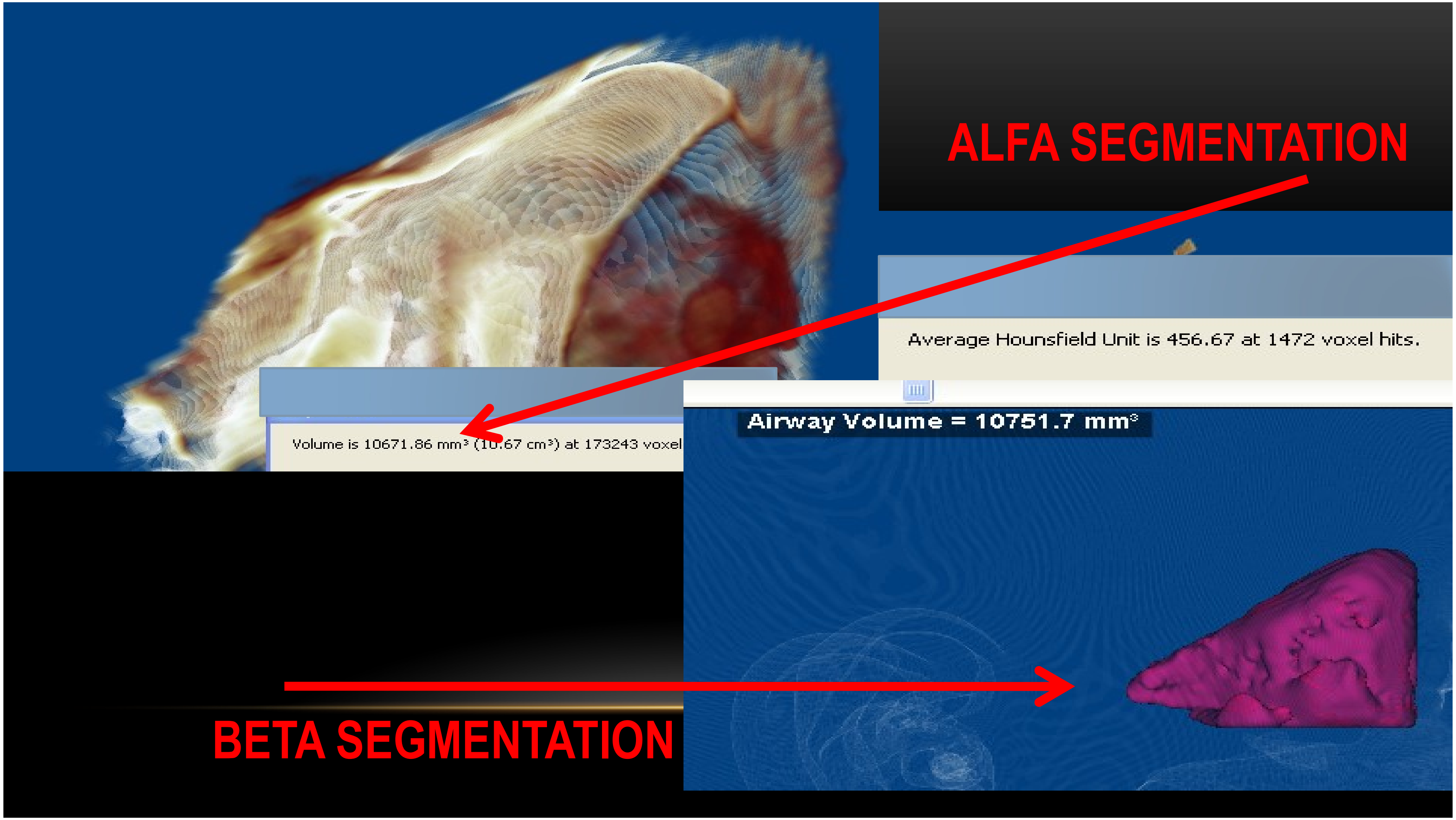
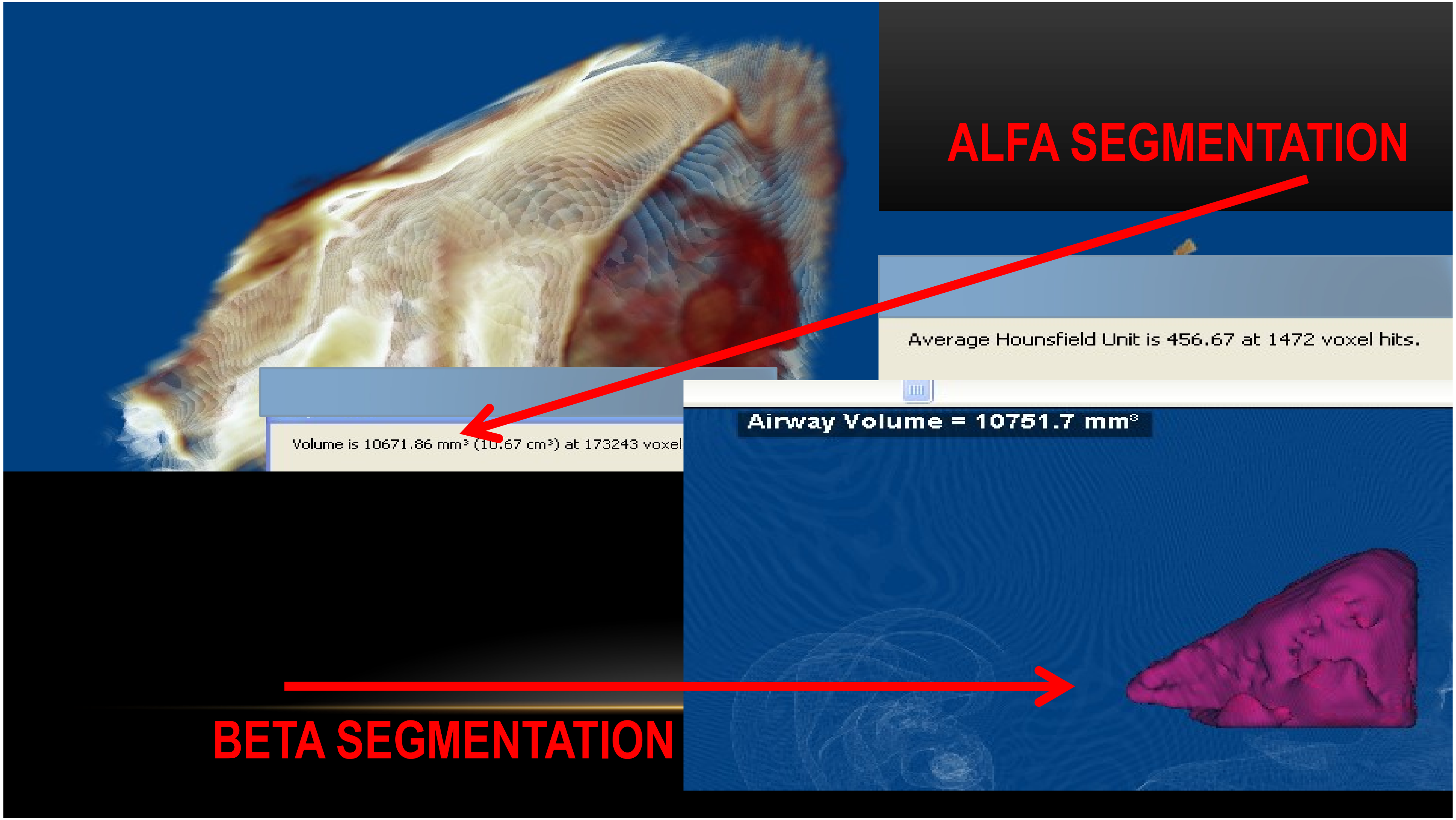
Short Title:	Orbital volume and le Fort III
Article Type:	Original Article
Keywords:	syndromic synostosis, orbital volume, midface advancement, distraction osteogenesis, Le Fort III osteotomy
Corresponding Author:	Felice Festa, Ph.D., M.D. Chieti-Pescara "G. d'Annunzio" University Chieti Scalo, Chieti ITALY
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	Chieti-Pescara "G. d'Annunzio" University
Corresponding Author's Secondary Institution:	
First Author:	Felice Festa, Ph.D., M.D.

VOLUME ASSESSMENT OF THE ORBIT FROM EXTERNAL SEGMENTATION (A)






ALFA SEGMENTATION
Average Hounsfield Unit is 456.67 at 1472 voxel hits.
Volume is 10671.86 mm³ (10.67 cm³) at 173243 voxel
Airway Volume = 10751.7 mm³
BETA SEGMENTATION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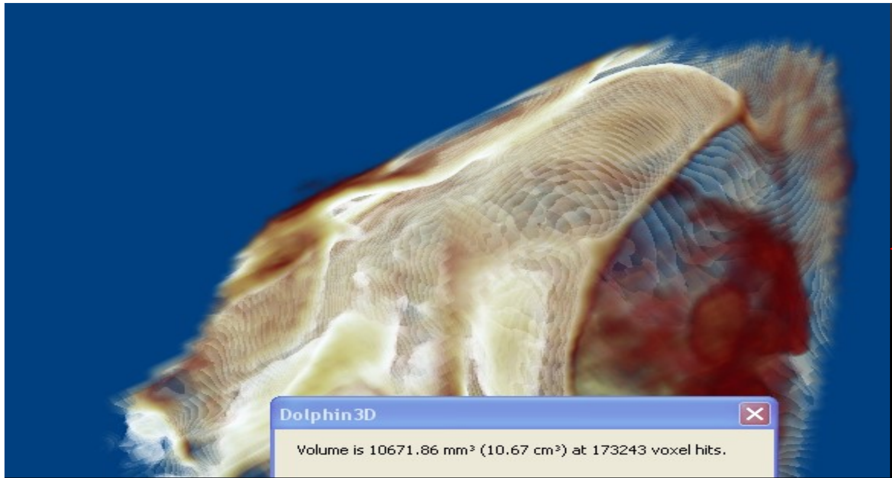
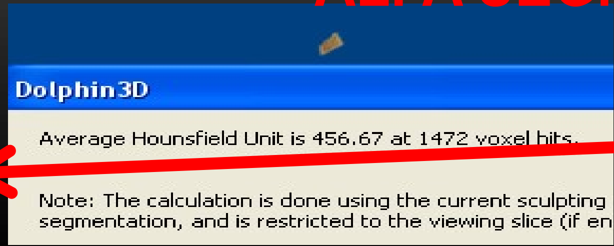
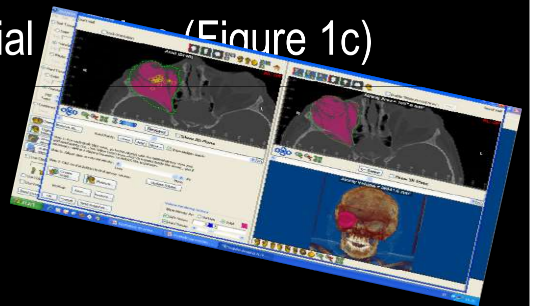
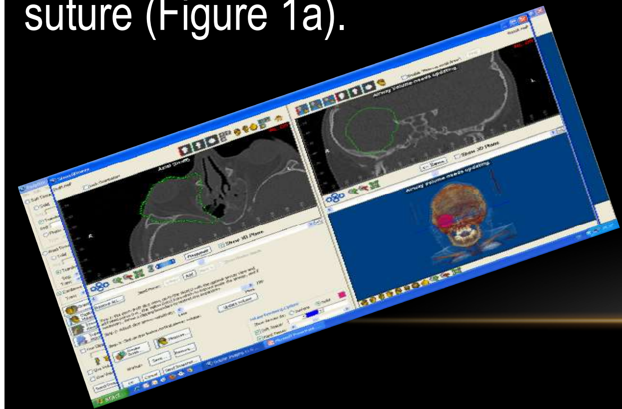




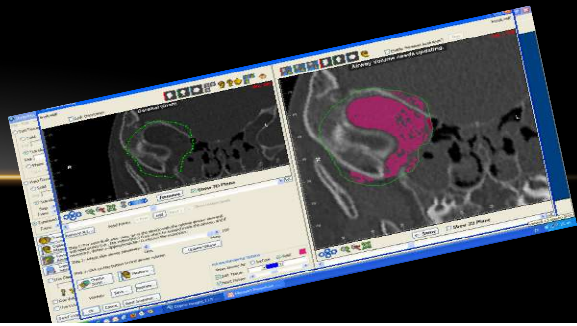
•On the sagittal plane, the 2D reference plane was located at the entry of the optic nerve, most medial [illegible] (Figure 1c)



On the axial cut, the 2D reference plane was fixed on the lateral frontozygomatic suture (Figure 1a).



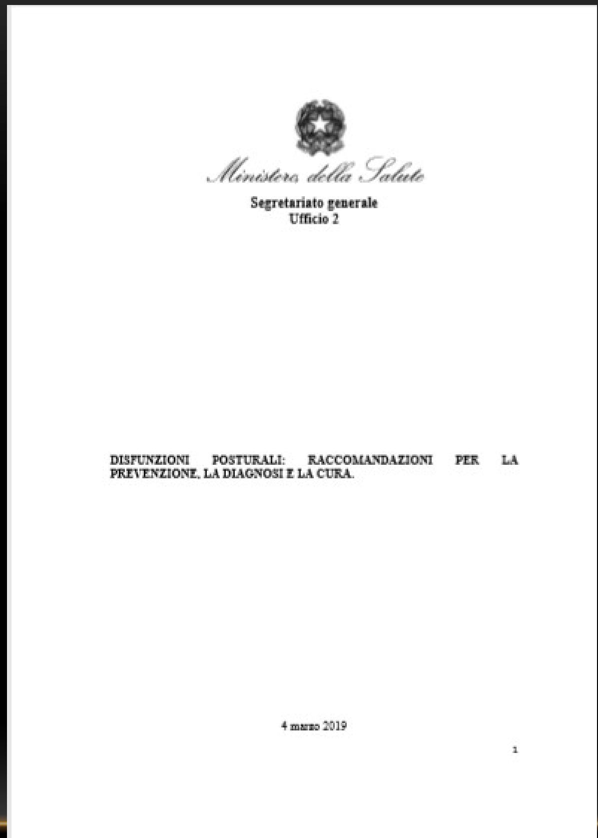
On the frontal plane, the 2D reference area corresponded to the section of the area of the lacrimal sack.



SINOSSI DELLE RACCOMANDAZIONI

Raccomandazione 1	***La valutazione dell'allineamento posturale deve prevedere uno standard di posizione.***	Forza della raccomandazione: A Grado dell'evidenza: I
Raccomandazione 2	***La diagnosi clinica di una disfunzione posturale richiede la valutazione dell'allineamento tra cranio e segmenti corporei e di questi tra loro nonché la palpazione di specifici distretti muscolari e punti di emergenza nervosa.***	Forza della raccomandazione: A Grado dell'evidenza: I
Raccomandazione 3	***La diagnosi di disfunzione posturale necessita oltreché di valutazioni cliniche anche di specifiche indagini strumentali per identificarne la natura e l'entità.***	Forza della raccomandazione: A Grado dell'evidenza: VI
Raccomandazione 4	***L'esame clinico di un disturbo posturale deve prevedere un percorso in senso cranio-caudale.***	Forza della raccomandazione: A Grado dell'evidenza: I
Raccomandazione 5	***Al fine di conseguire un miglioramento dello stato di salute dell'individuo si deve prevedere non solo il trattamento degli aspetti sintomatici del soma, ma anche quello delle condizioni causali, tenuto conto della correlazione cranio-caudale.***	Forza della raccomandazione: A Grado dell'evidenza: I

POSTURAL dysfunctions: RECOMMENDATIONS FOR PREVENTION, DIAGNOSIS AND CARE.



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DISFUNZIONI POSTURALI: RACCOMANDAZIONI PER LA PREVENZIONE, LA DIAGNOSI E LA CURA.

4 marzo 2019

1

CHILDHOOD

During developmental age it is advisable that any postural dysfunction be intercepted early, as it could cause problems in psycho-somatic development.

CHILDHOOD

Visual, vestibular and occlusal disorders play an important role in the determinism of postural dysfunctions of the head with alterations of the perception of the vertical subjective. At the same time head posture dysfunctions can cause imbalances in the cranial caudal direction.

Feragalli B, Rampado O, Abate C, Macrì M, Festa F, Stromei F, Caputi S, Guglielmi G. Cone beam computed tomography for dental and maxillofacial imaging: technique improvement and low-dose protocols. La radiologia medica, 2017. 122(8): 581-588.

Festa F, et al. Maxillary and mandibular base size in ancient skulls and of modern humans from Opi, Abruzzi, Italy: a cross-sectional study. World J Orthod, 2010, 11,e1-e4.

CHILHOOD

The presence of postural dysfunction sustained by cross bite, anterior or lateral open bite, mandibular deviation and vitiated habits, requires the correction of these alterations

CHILDHOOD

In the case of postural dysfunction associated with class I, II or III malocclusion or the temporomandibular joint, the dentist starts the treatment path of his relevance, always within a global rehabilitation course. The most common corrective measures include the prescription of orthopedic-functional devices to allow the harmonious development of the arches. The therapies recommended in the pediatric age make use of the rapid expander of the palate and the function regulator of Frankel. In the case of a short frenulum the support of speech therapy and, in some selected cases, surgical therapy should be considered.

ADULTHOOD

In adulthood, it is useful to carry out a postural assessment in order to identify possible dysfunctions, even if not symptomatic, as early interception and timely treatment can avoid evolution in pathological conditions. The sedentary lifestyle must be discouraged, while moderate and constant physical activity must be promoted, appropriate to the individual characteristics, also for the purpose of maintaining an adequate body weight.

ADULTHOOD

In the case of an adult patient with altered posture of a verifiable craniomandibular nature, it is also advisable to have a dental examination with an accurate clinical examination including the assessment of pain according to the Visual Analogic Scale (VAS) associated with intra and extra-oral photo records. Furthermore, it is essential to subject the patient to a three-dimensional diagnosis by means of beam low dose cone of the facial massif and the first cervical vertebrae. As a diagnostic study, magnetic resonance imaging (MRI) and further tests with specific instrumentations may be indicated in patients with intra-articular disorders of the temporomandibular joint (ATM) (http://www.salute.gov.it/imgs/C_17_pubblicazioni_2717_ allegato.pdf) to exclude joint problems or pathologies due to alteration of the physiological curvatures or dimensional alteration, of symmetry and position of the jaw both in antero-posterior and lateral-lateral sense.

ADULTHOOD

In adulthood, postural dysfunction is often expressed with an algic symptomatology of the spatial and functional bodily subsystems: the mandible and the skull connected by the temporomandibular joint, the scapulo-humeral belt (with the acromio-clavicular joints, sternoclavicular and scapulohumeral), page 34

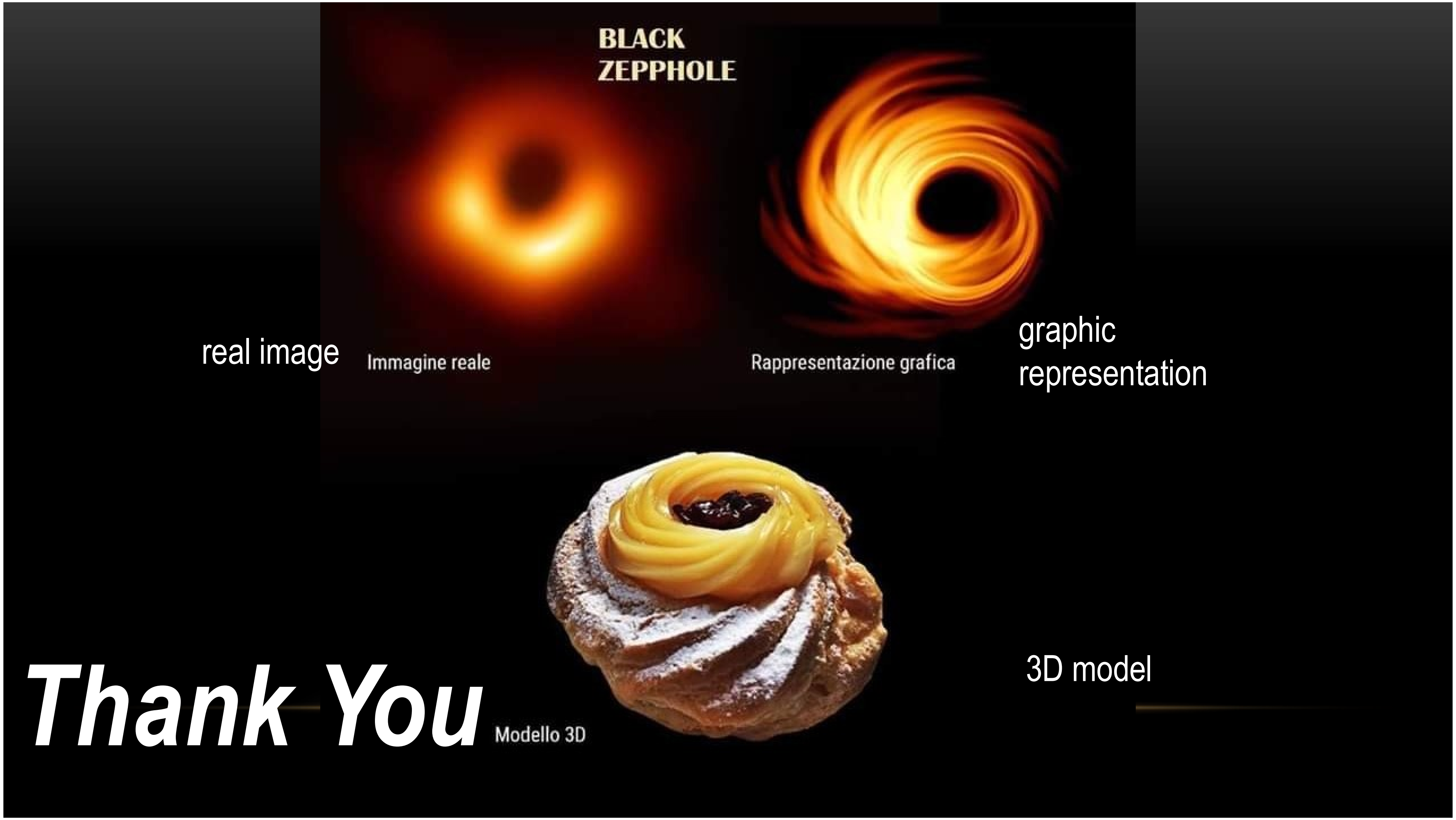
AGE> 65 YEARS

Even in individuals over the age of 65, in conditions of well-being or in the presence of specific symptoms, which does not correspond to pathologies highlighted with common diagnostic tests, it is useful to carry out postural evaluation in order to identify any dysfunctions

Postural evaluation (measurement of arrows and postural symmetries, evaluation of compensation) is the diagnostic method of reference for a diagnosis of postural dysfunction. If necessary, the reference specialist will be able to take advantage of further tests with specific instruments (http://www.salute.gov.it/imgs/C_17_pubblicazioni_2717_allegato.pdf).

The presence of postural dysfunction sustained by a cross-shaped bite, anterior or lateral open bite, mandibular deviation and flawed habits requires the correction of these alterations. In the growing subject, orthodontic therapeutic planning can include different phases, with intermediate periods, during which the growth and development of the subject as well as the dental exchange must be monitored. The clinical picture of crossbite should be treated early, taking into account the low rate of spontaneous correction of this in early deciduous and mixed dentition. In the presence of sagittal and antero-posterior malocclusions closely associated with spinal dysfunctions, in the growing patient, the therapeutic approach can be aimed at conditioning / controlling the growth of the maxilla with the application of functional devices. In growth term subjects, the basal forms of altered development of the maxillary bones can be corrected by resorting to a surgical-orthodontic approach. Corrective occlusal therapy is associated with functional language and speech therapy exercises aimed at correcting the incorrect posture of the head and column.

In patients with temporomandibular and postural dysfunctions therapies that use the gnathological protocol by means of a splint are recommended. In addition, active multi-bracket or aligner devices can be used. In severe occlusal diseases due to malocclusion of class I, II and III, the presurgical and surgical jaw orthodontic therapy is used, as well as the prosthetic restoration in case of partial or total edentulism.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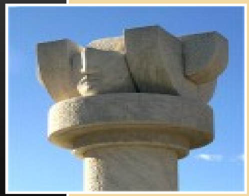
real image
Immagine reale
Rappresentazione grafica
graphic
representation
3D model
Thank You
Modello 3D



University “G. d’Annunzio” Chieti – Pescara

Department of Medical , Oral and Biotechnological Science

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Director Prof. Felice Festa

DIAGNOSIS AND THERAPY: THE TRANSITION FROM 2D TO 3D.

F. FESTA, M. MACRÌ

20th Orthodontic Congress of Russia in Sochi

23th May 2019

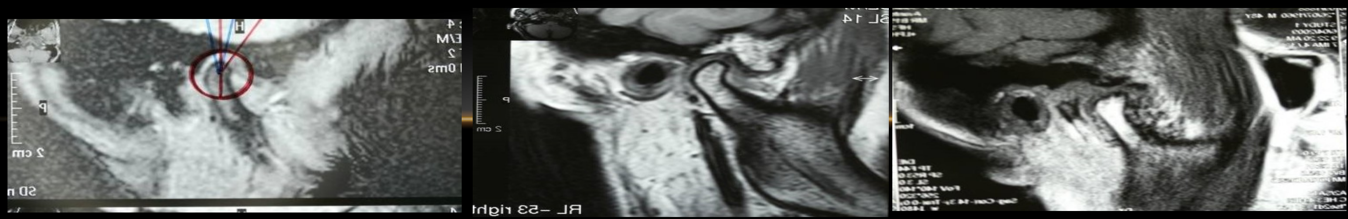
Evaluate the accuracy and reliability of cephalometric measurements obtained from the 3D X-ray CT technique cone beam for the purpose of orthognatodontic diagnosis

⇩

Review

Until the advent of 3-D technology, the mandibular condyle and the Temporo-mandibular joint (TMJ) were always individuated through 2-D images (skull radiographs and Computed Tomography (CT)) - although the TMJ complex morphology surrounded by osseous tissues caused superimposition of 2-D images on conventional radiographs; CT scans overcame this inconvenience, but the Cone Beam Computed Tomography (CBCT) engineering also overcame the CT technique, [1] producing images with sub-millimetre spatial resolution and providing 3-D representation of the hard tissues with minimal distortion, short scanning times, and radiation dosages of up to 15 times lower than those of conventional CT scans, and with a lower cost of the machine. In the TMJ area, CBCT allows - with a higher detectable rates for exact location and size – the diagnosis of osteoarthrosis, [2] also correlating it to the age of the patient,[3] and the individuation of remodelling areas, [4] erosions, osteophytes, lines of fracture, bone resorption, [1] condylar displacement after orthognatic surgery, [5] or particular clinical evidences, such as the trifid condyle.[6] These evaluations have been previously obtained by using 2-D images, combining axial sections with sagittal and coronal ones, or combining different radiographic techniques, in order to obtain a correct diagnosis of the proper TMJ pathology.

Finally, also Magnetic Resonance Imaging (MRI) was proposed to obtain a 3-D reconstruction of the condyle, [8] through recording of 15 sagittal slides, but this technique can only be employed to calculate the changes in condylar volumetric amplitude, because of its low accuracy. [8]In conclusion, although the existence of many imaging techniques, there is no single one among them, readily available to the orthodontist, that provided accurate 3-D representation of all osseous aspects of the TMJ complex and associated structures, **until the advent of the CBCT**.



CBCT technology allows to reproduce multiple images including axial, coronal and sagittal planes, and to view the images interactively, scrolling from axial to para-sagittal sections, so to rate the confidence about the presence or absence of pathology, [9] and also to reliable calculate anatomic linear measurements inherent to TMJ, [10] or to obtain 3-D views of the TMJ structure. Linear measurements taken on CBCT scans were often tested for their accuracy respect to anatomic truth on dry skulls and resulted more accurate respect to the traditional radiographs, [11-14] probably because of the magnification index and the super-imposition of the bone structures visualized on traditional radiographs technique, respect to CBCT scans. [11]For example, condylar length and height measured on lateral and postero-anterior radiographs resulted significantly greater than anatomic truth by 2.28 mm to 10.29 mm (by 7.3% to 25.9%), on average, while, on the contrary, some linear measurements on CBCT scans, the Pogonion to Condylion distance and the Gonion to Condylion distance, showed only 0.28 mm to 0.94 mm of differences with the anatomic truth (on dry skulls), with no statistical significance[12] . [13]*As Arnett and McLaughlin says,* with the advent of teleradiographs was possible and proper to frame and define benchmarks, even and especially in an attempt to define the directions of the treatment. Measurements were made of soft tissues, with the big limit of flattening. It was taken for granted that if a patient had skeletal cephalometrics values – so to speak normal- facial harmony also must reflect this "ideal" situation, without taking account of the fact that dento-skeletal values were obtained according to datum points that are located in skeletal structure difficult at times to identify and find, and that are not reflected in an objective reality of facial proportion.

- Because of these differences, to try to reach with orthodontic treatment this "normality" often does not led to facial harmony. With the need to look beyond the cephalometrics values imposed by a fair and justified scientific rigor, was introduced in 1999 by Arnett and Bergman reanalysis of soft tissue facial proportions ("Soft Tissue Cephalometric Analysis", ACTM) which identified an imaginary vertical line ("True" Vertical Line ", TVL) perpendicular to the natural position of the head ("Natural head position," NHP).
- This new analysis was able to quantify and therefore assist in the finalization of the surgical-orthodontic treatment, because it can predict and prevent soft tissue decay after the intervention of a specialist

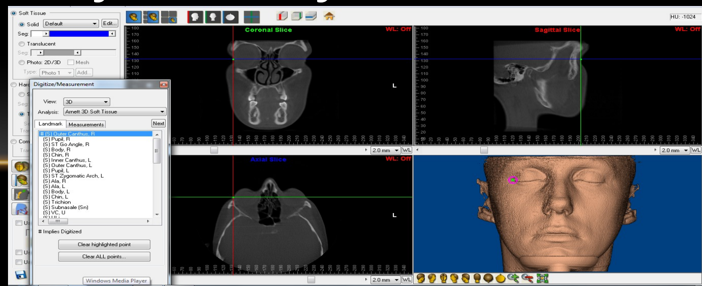
According to Arnett and McLaughlin, to evaluate the whole face, it is necessary to consider the natural position of the head and centric occlusion with lips relaxed and rested. Front-view gives us indications about the size, vertical lines, and contours of the face, essential for the diagnosis and treatment plan. The clinical examination must therefore necessarily be three-dimensional, it can't be based exclusively on photos that might upset our final evaluation. The general form of the oval of the face should be framed and described, it is necessary to note the presence of any anomalies between the half side right than left, consider for example the *inter-zygomatic* distance and keep in mind that the amplitude of the bigonial angle is ideally 30% less than the distance *inter-zygomatic*. Skeletal and dental factors strongly influence the harmony of facial profile and produce a balanced relationship between the base of the nose, lips, Chin, point A and point B of the soft tissues. The ACTM of Arnett and coll. finds nine factors that influence this harmony.

Dento-skeletal factors: projections,vertical projection incisive on the real; incisive inclination higher than the maxillary occlusal plane;overjet; lower incisor projection on a vertical real;lower mandible incisor angle. Heights and lengths, incisive exposure exceeding the lips relaxed; overbite;mandibular anterior height (height mandibular incisor to Chin);rear height (angle between maxillary occlusal plane and vertical).

The midline of the face must be drawn through the filter of the upper lip and the midpoint of the root of the nose. The latter is set at half of both canthi of the eyes.

It is particularly important for Orthodontists and surgeons to define midlines inter maxillary incisors compared to the filter, because almost all of the patients use it as a failed signature treatment.

Were well defined values of harmony, in order to measure the balance between the facial structures: total facial harmony, harmony of the inferior orbital rim on soft tissues compared to maxillary, harmony between maxilla and mandible.



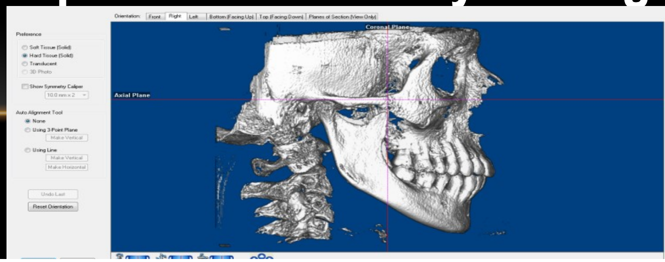
Material and Methods

Study Design

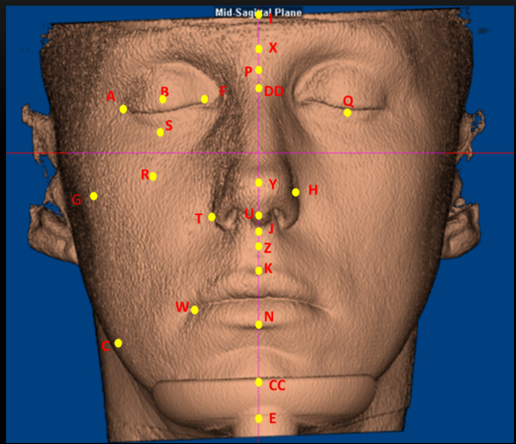
A specific anatomic component of the temporomandibular joint is the mandibular condyle which articulates with the temporal bone in the mandibular fossa. During the growth, and in response to orthodontic treatment, the condyle develops in many directions relative to individual variations. Deviations in the growth, if not detected early, may lead to bone destruction and osseous deformation of the mandibular condyle resulting in growth disturbances and dysmorphic facial features. In this research project, the mandibular condyles will be summarized by a continuous outline so that the information about the object will come from the boundary. A functional data analysis will be thus proposed in order to detect abnormalities of their shape and size. In addition our study aims to carry out a 3D CEPH aesthetic-analysis that can be helpful in treatment plan and all malocclusions in their therapeutic realization from an aesthetic and functional point of view. The shape of the bone and the shape of the soft tissue will be analyzed together.

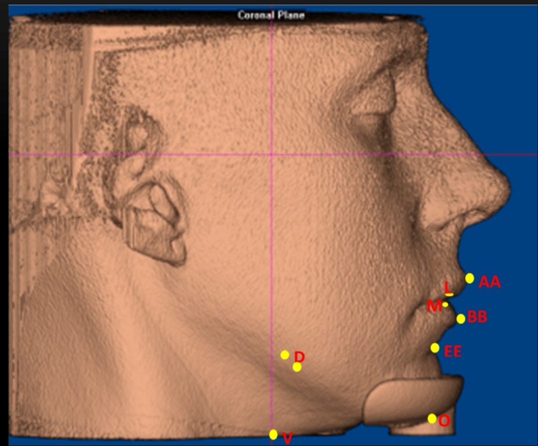
CEPHALOMETRIC ANALYSIS

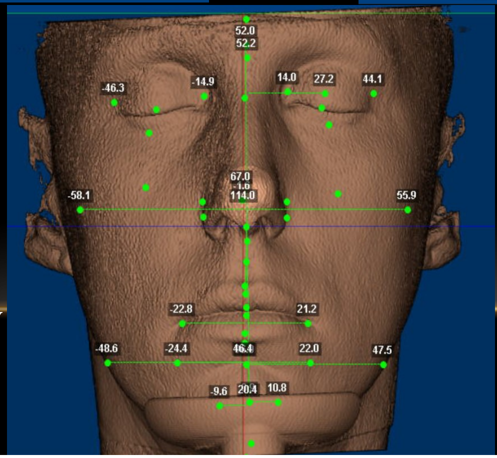
- All subjects will be in good health, no person of the Group will have a prior history of Craniofacial trauma or congenital anomalies. Will be acquired 3D CT Scan images processed by DICOM files in Dolphin 3D Software. Our project will rely on the use of this software without which it would not have been possible to diagnose three-dimensional face trying to bring back on soft tissues very accurately what we identify in the skeletal portion. We will transpose into digital what previously was created from photos of faces, finding how advantageous you can display in the three spatial coordinates our landmarks. After acquiring the Dicom files of subject analysis will be operated a reslicing and a re-orientation of the Dolphin's head always using Imaging second axial and Coronal planes.



THE POINTS OF THE SOFT TISSUES THAT WILL BE LOCALIZED IN A HALF FACE ARE THE FOLLOWING







In order to assess intra-operator and inter-operator errors due to the individuation of condylar structure, the CBCT data of patients will be processed by the same operator two times

CBCT images will be all taken with the subject in an upright sitting position with the back as perpendicular to the floor as possible. The head will be always stabilized with ear rods in the external auditory meatus. The subjects will be instructed to look into their own eyes in a mirror 1 mt in front of them to obtain natural head position

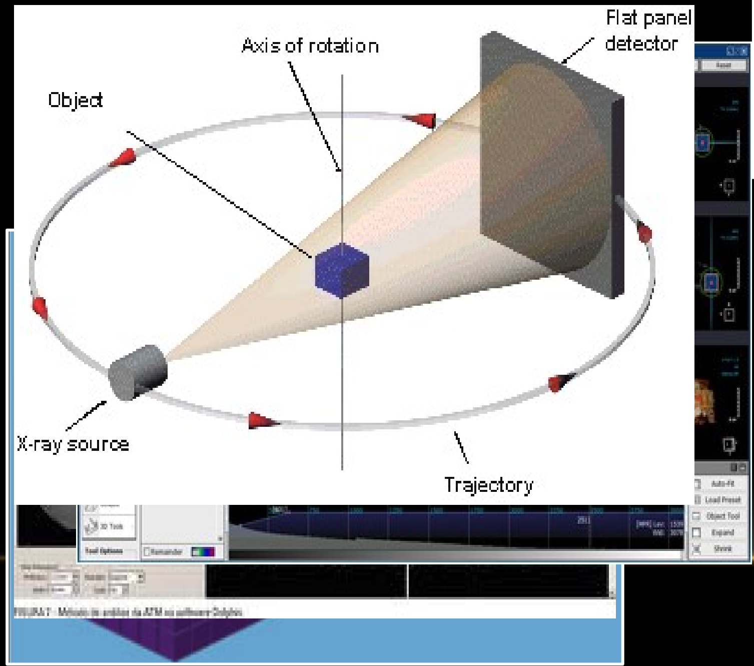
MATERIALS AND METHODS: the project involves 3 steps

I *Step*: selection of patients 34 SUBJECTS

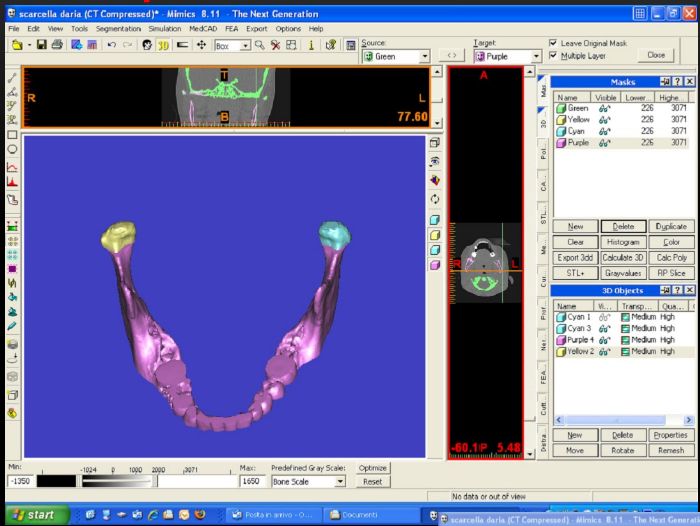
INCLUSION CRITERIA :

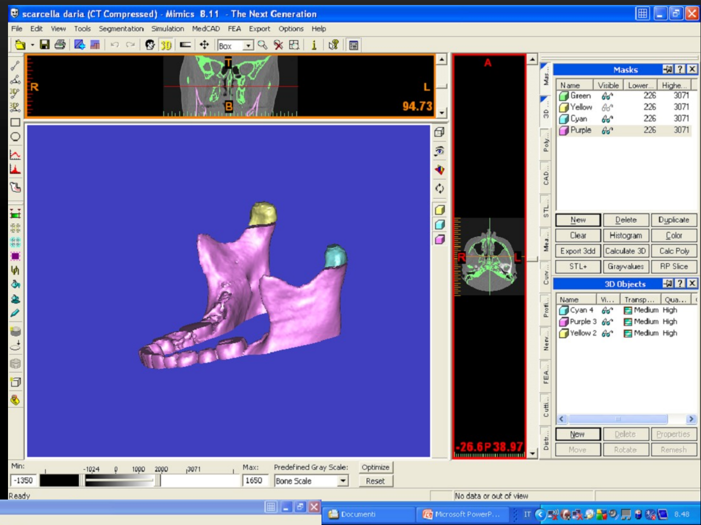
- age 11-30 years
- COMPLETE Permanent dentition
- NO TMD, BUT ONLY MALOCCLUSION
- NO Agenesis AND DENTAL INCLUSIONS
- NO orthognathic surgery
- NO BRACHI AND EXTREME dolichos

All subjects were undergo to **CBCT** by **Pax Zenith 3D Vatech**

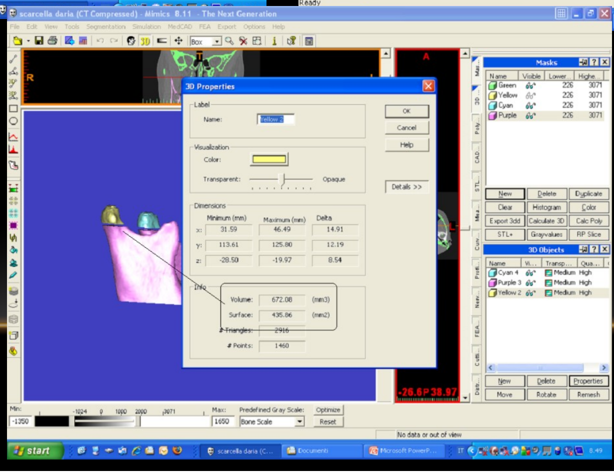


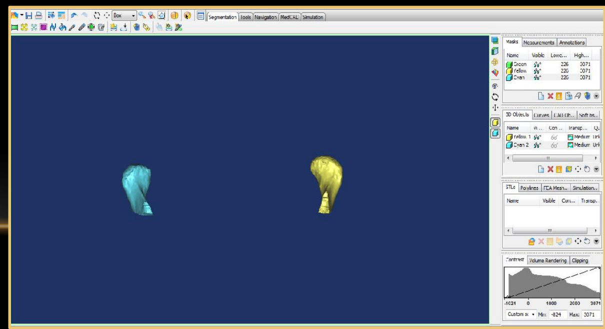
Step 2: data collection





The calculation of volume and condylar surface performed with the software **MIMICS® ver. 10.01**

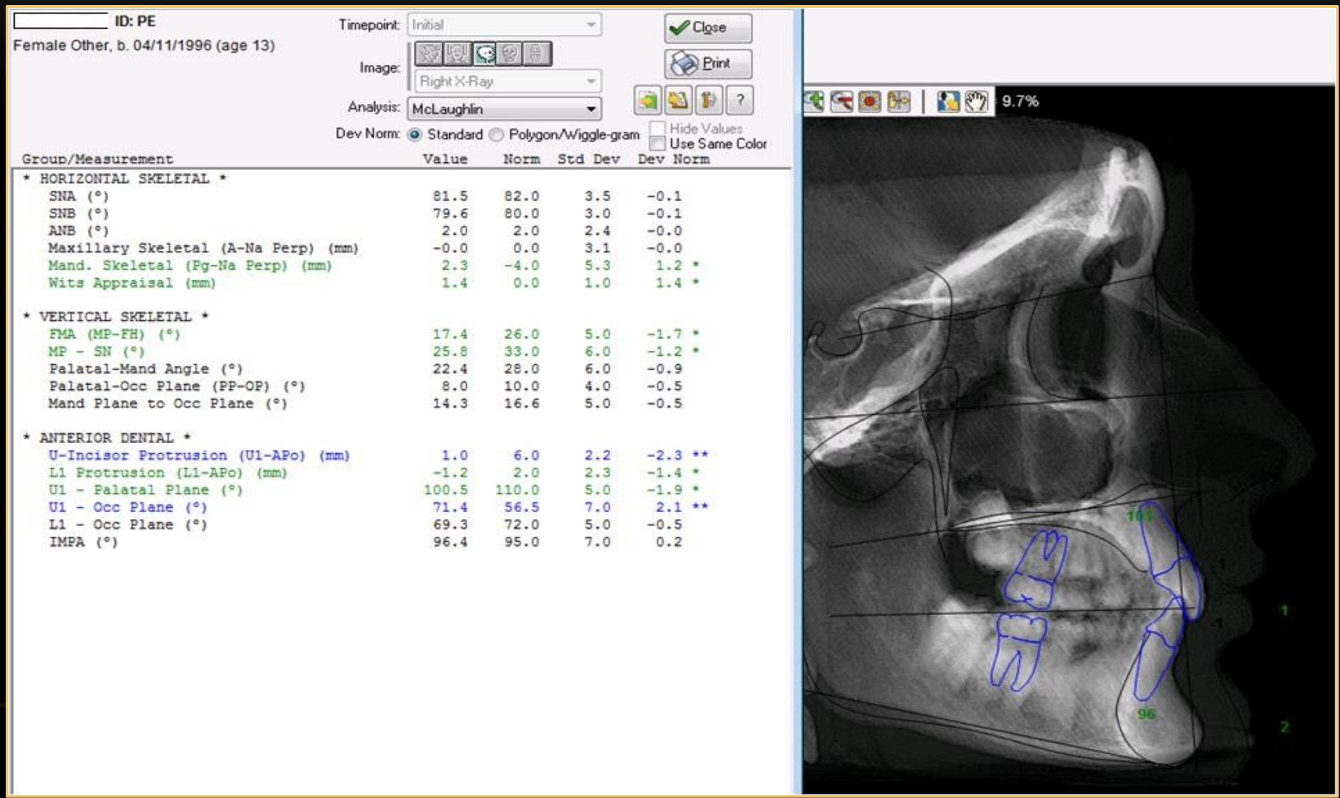




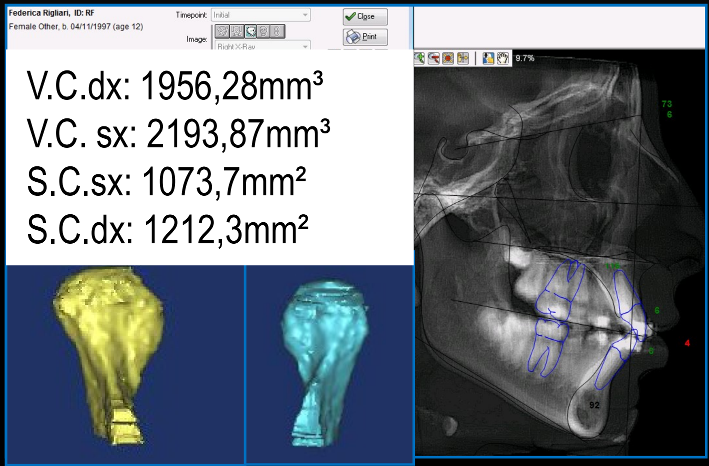
FOR EVERY PATIENT WAS PERFORMED THE CEPHALOMETRIC ANALYSIS OF STEINER BY Dolphin3D, ON FILE DICOM FROM ACQUISITION CBCT

Tool “ *DOLPHIN CEPH TRACING* “

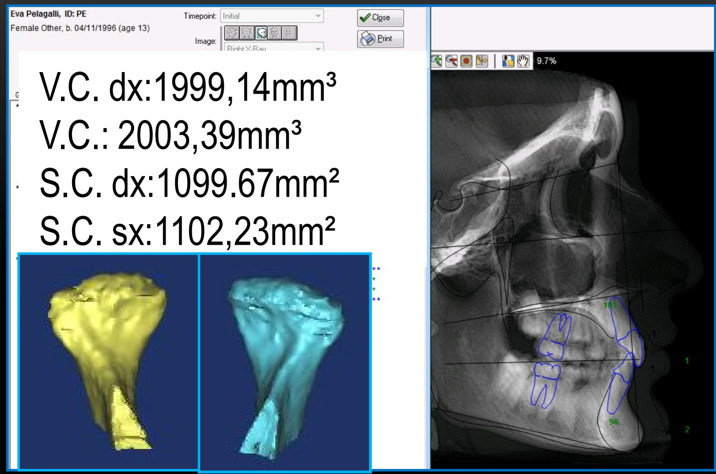
“ DOLPHIN CEPH TRACING “



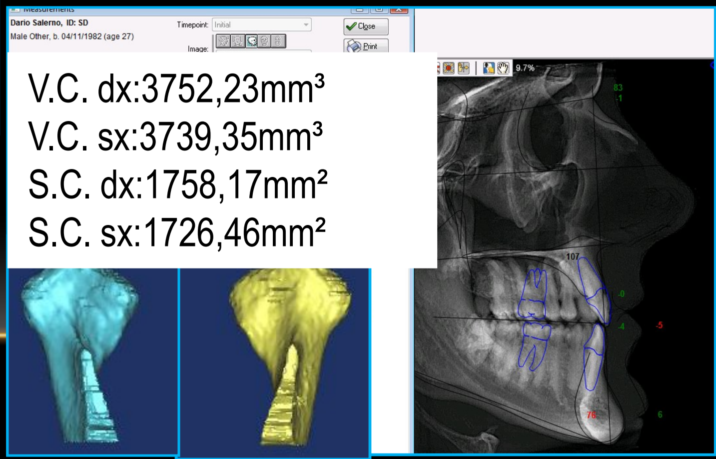
PATIENT IN CLASS II

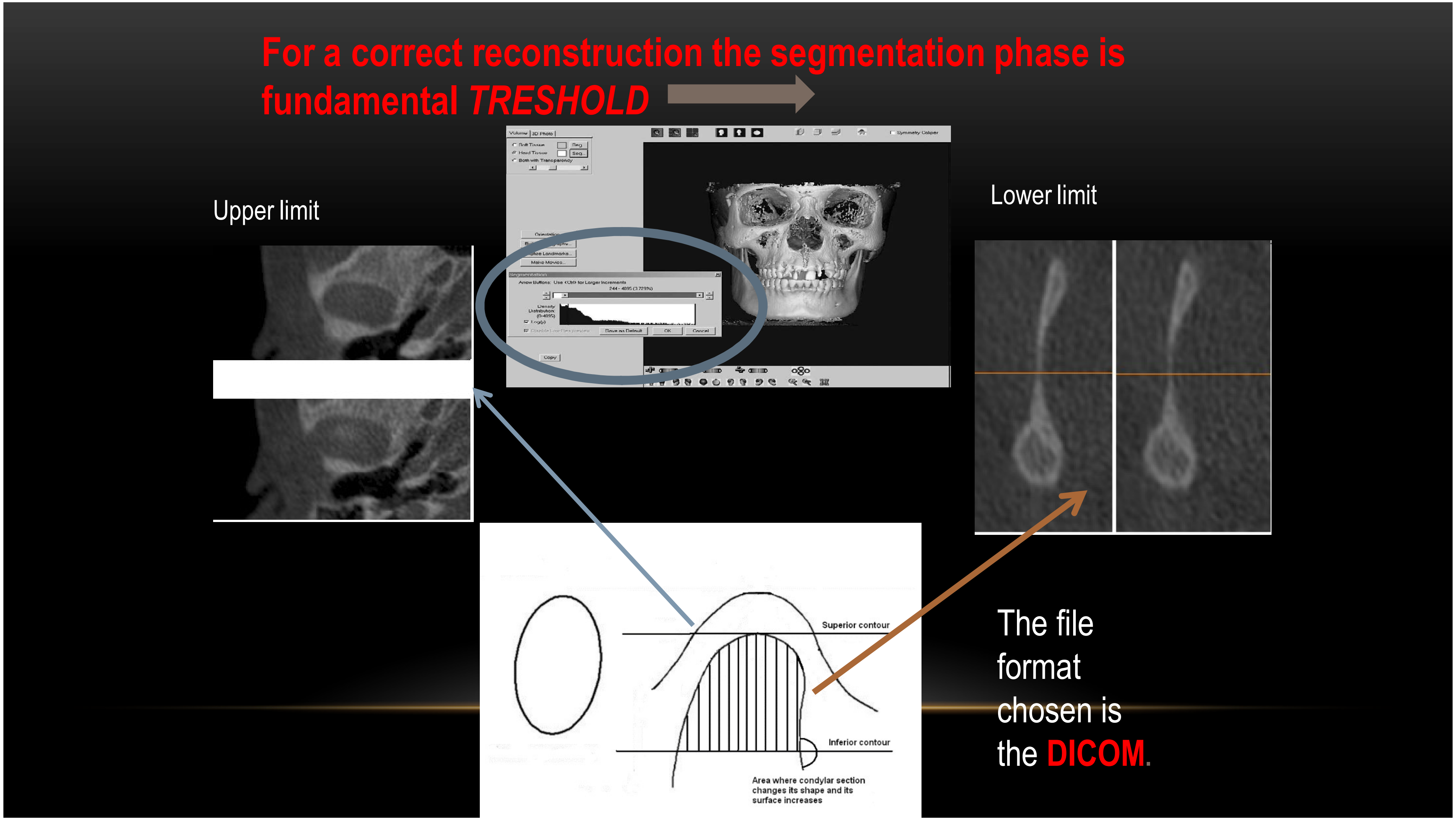


PATIENT IN CLASS I



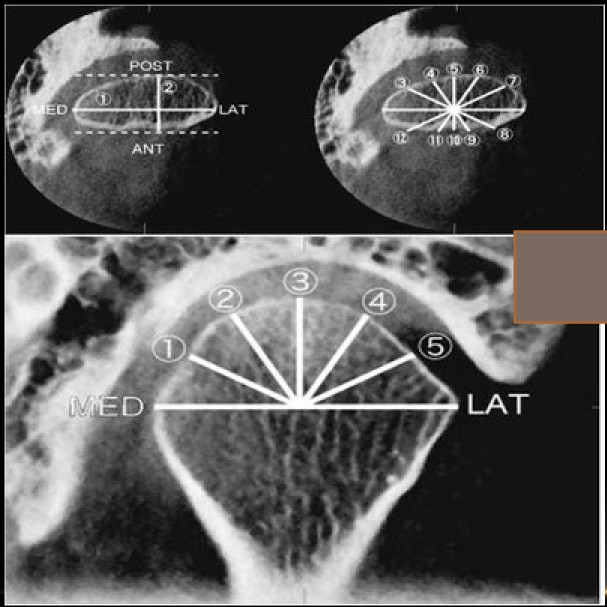
PATIENT IN CLASS III

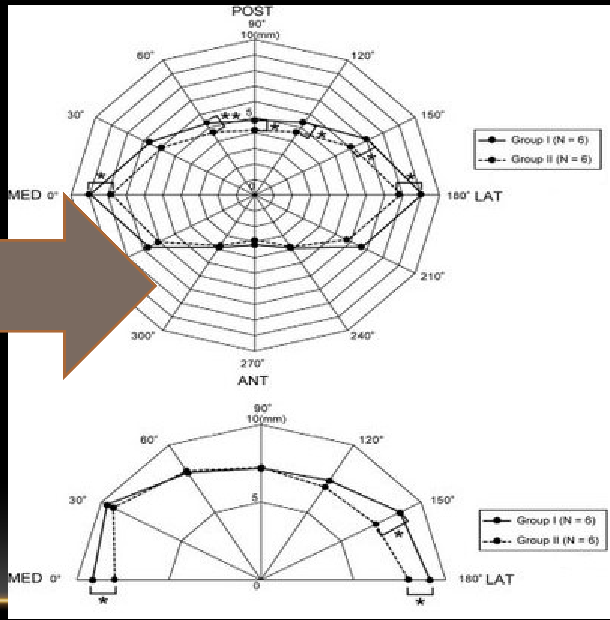



For a correct reconstruction the segmentation phase is fundamental TRESHOLD
Upper limit
Lower limit
Superior contour
Inferior contour
Area where condylar section changes its shape and its surface increases
The file format chosen is the DICOM.

Step 3: Analysis and processing of the data

The relationship with the skeletal class was studied using the Functional Data Analysis (FDA) proposed by Ramsey and Silverman in 2002.





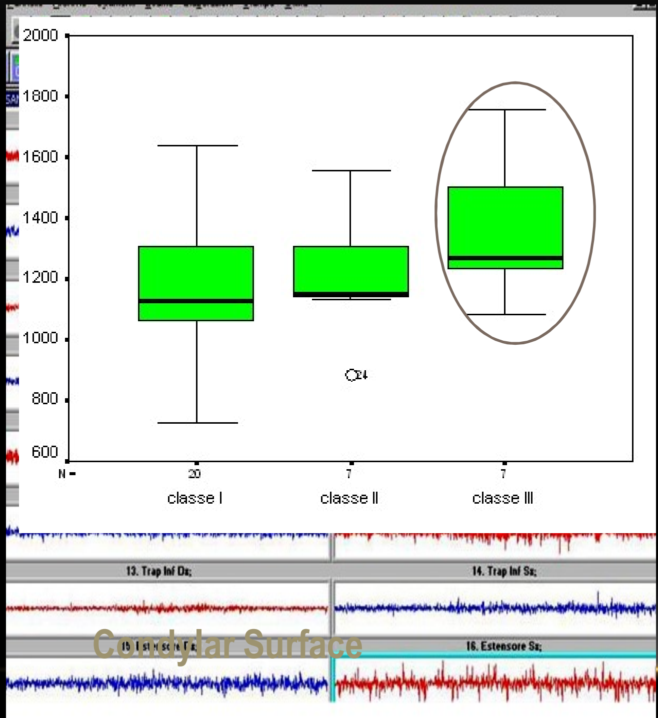
No statistically significant difference(p> 0.05)

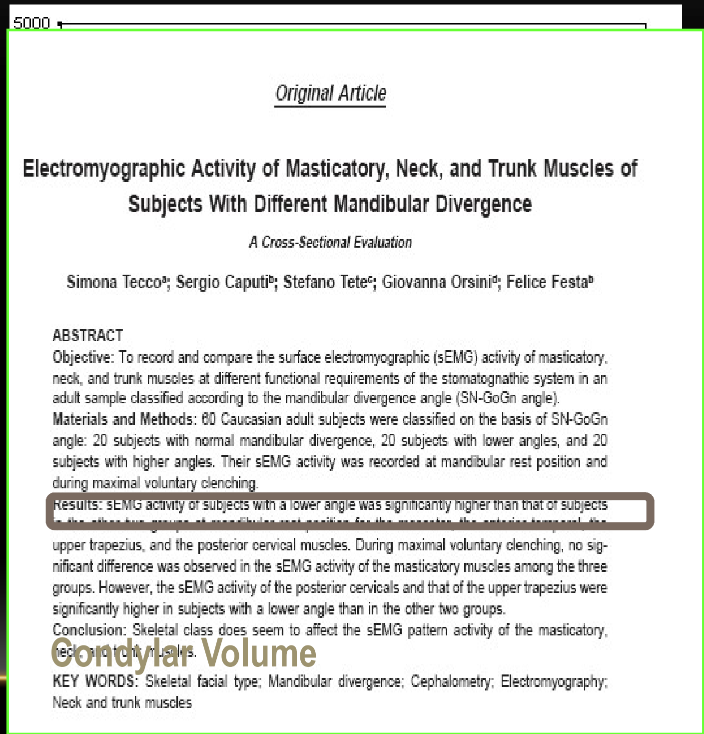
Test Statistico per la comparazione tra soggetti appartenenti alle 3 classi scheletriche

	Volume (dx)	Volume (sx)	Superficie (dx)	Superficie (sx)
Chi-Square	1,272	1,748	2,992	1,287
df	2	2	2	2
Asymp. Sig.	,529	,417	,224	,525

Quantitative observations: the skeletal class does not seem to be associated with particular dimensional values of the condyle.

Qualitative observations: the subjects in skeletal class III tend towards values of volume and surface higher than the other groups we assume a role of the musculature.





Original Article

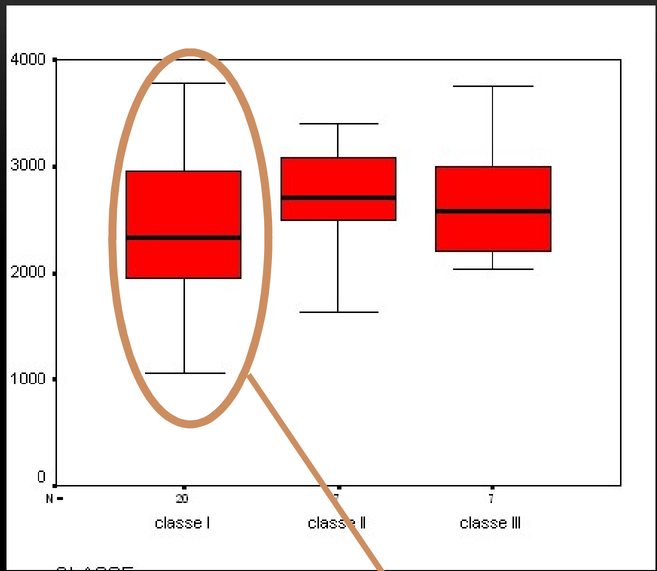
Electromyographic Activity of Masticatory, Neck, and Trunk Muscles of Subjects With Different Mandibular Divergence

A Cross-Sectional Evaluation

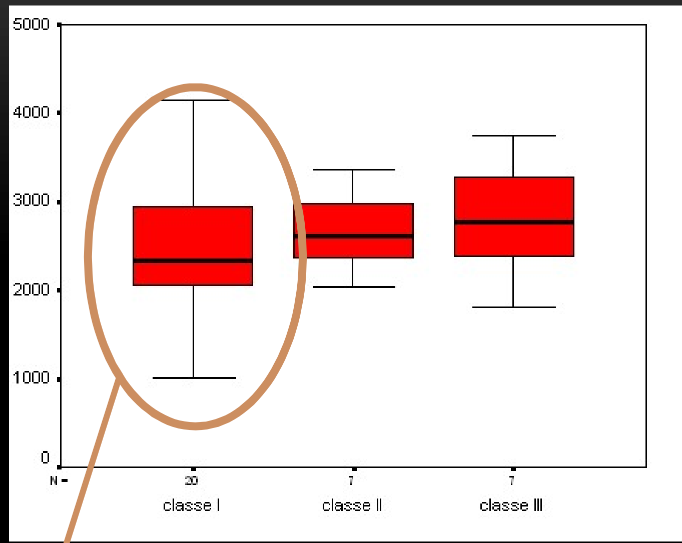
Simona Tecco[a]; Sergio Caputi[b]; Stefano Tete[c]; Giovanna Orsini[d]; Felice Festa[b]

ABSTRACT
Objective: To record and compare the surface electromyographic (sEMG) activity of masticatory, neck, and trunk muscles at different functional requirements of the stomatognathic system in an adult sample classified according to the mandibular divergence angle (SN-GoGn angle).
Materials and Methods: 60 Caucasian adult subjects were classified on the basis of SN-GoGn angle: 20 subjects with normal mandibular divergence, 20 subjects with lower angles, and 20 subjects with higher angles. Their sEMG activity was recorded at mandibular rest position and during maximal voluntary clenching.
Results: sEMG activity of subjects with a lower angle was significantly higher than that of subjects ... upper trapezius, and the posterior cervical muscles. During maximal voluntary clenching, no significant difference was observed in the sEMG activity of the masticatory muscles among the three groups. However, the sEMG activity of the posterior cervicals and that of the upper trapezius were significantly higher in subjects with a lower angle than in the other two groups.
Conclusion: Skeletal class does seem to affect the sEMG pattern activity of the masticatory, ...
KEY WORDS: Skeletal facial type; Mandibular divergence; Cephalometry; Electromyography; Neck and trunk muscles

Condylar volume dx



Condylar volume sx



The subjects in the class I have a range of values of volume and surface wider than the other 2 groups because it is the largest sample

test of Kruskal-Wallis

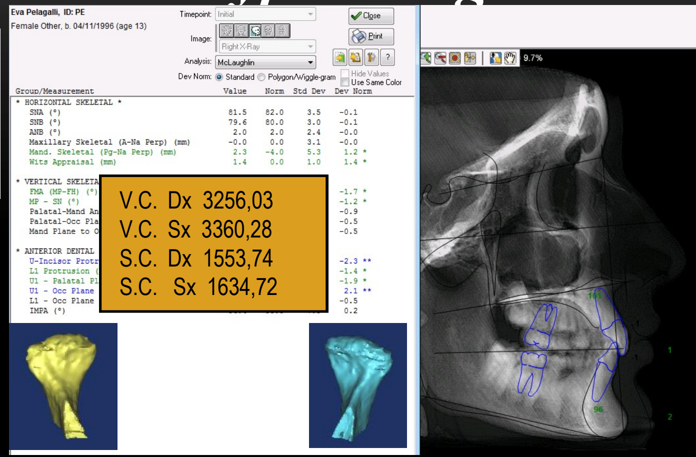
Test statistico per valutare le differenze tra I 3 gruppi ipo-, normo- ed iper-divergenti

	ETÀ	Volume dx	Volume sx	Superficie dx	Superficie sx
Chi-Square	1,968	2,365	3,273	1,691	3,078
df	2	2	2	2	2
Asymp. Sig.	,374	,307	,195	,429	,215

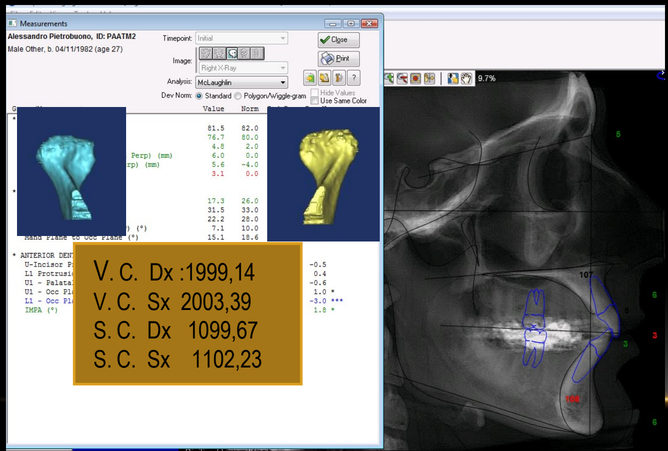
a Kruskal Wallis Test
b Grouping Variable: DIVERGENZA MANDIBOLARE

$p<0.05$

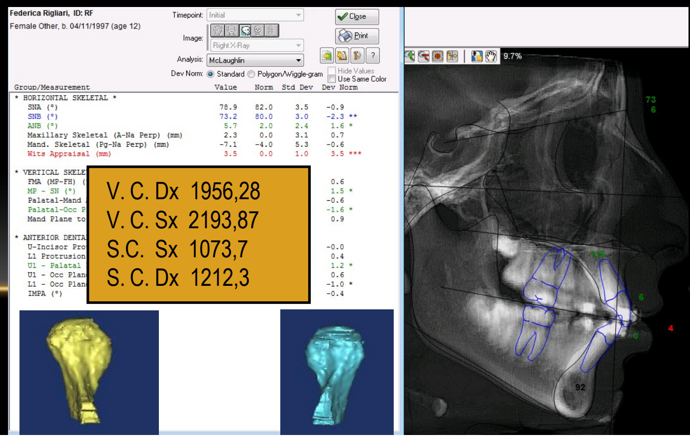
Patient hypodivergent



Patient normdivergent

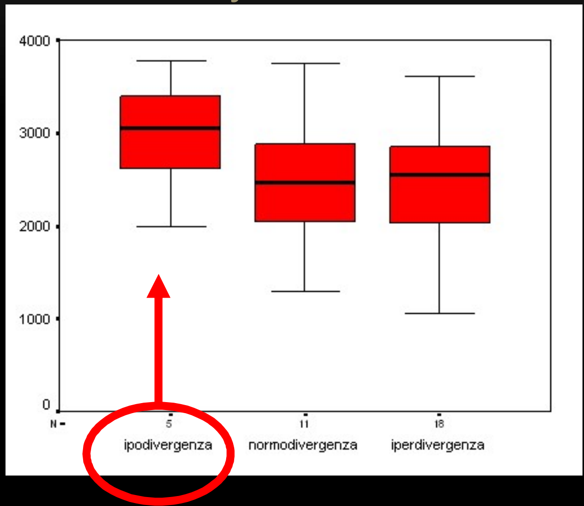


Patient hyperdivergent

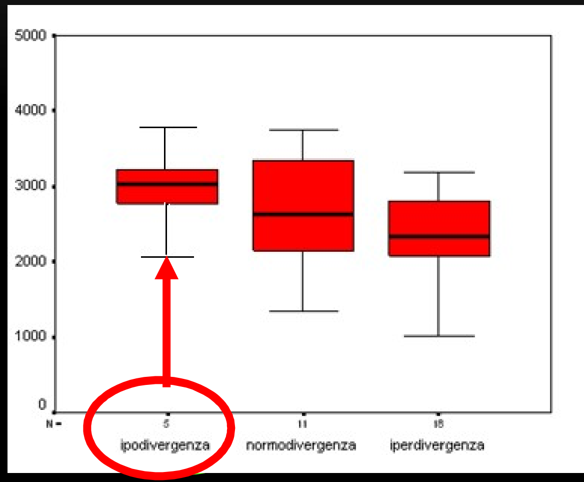


However, the qualitative analysis of the data showed a difference of condylar volume compared to the different facial types

Volume condyle dx

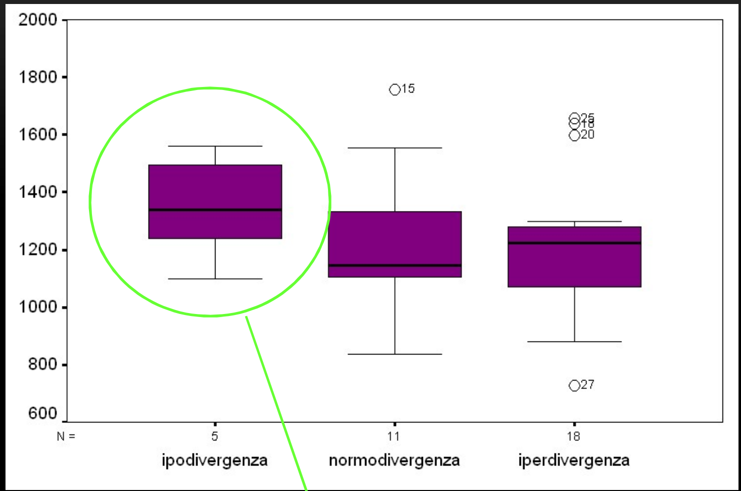


Volume condyle sx

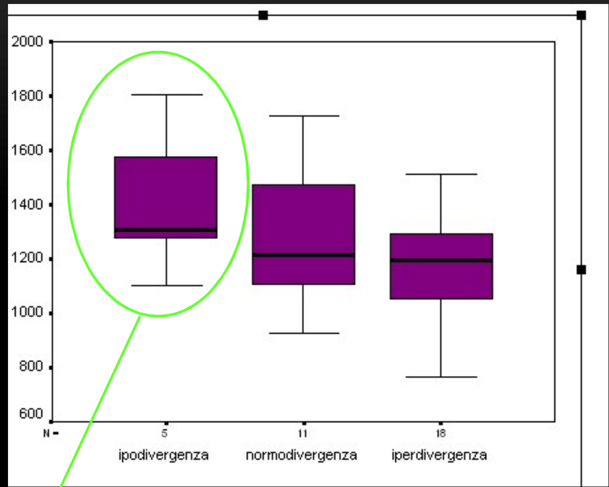


Values greater in volume than the other 2 groups in ipodivergent patients

Surface **condyle dx**



Surface **condyle sx**



Even for the condylar surface, ipodivergent patients have higher values than the other two groups

THEY HAVE CONSIDERED AN ANIMAL MODEL FAST POSTNATAL GROWTH, TO STUDY THE CHANGES OF CALCIFIC TISSUE OF THE MANDIBULAR CONDYLE DURING THE DISTORTED MUSCLE FUNCTION, AFTER APPLICATION OF A BITE PLATE, DESIGNED TO MOVE THE JAW ON THE LEFT IN CLOSING, THE LEFT CONDYLES RESULTED BE MORE BIG AND THICK THAN THE RIGHT ONES, AND THE RIGHT MASSETER SMALLER THAN THAT LEFT.

ORIGINAL ARTICLE

Three-dimensional changes in the condyle during development of an asymmetrical mandible in a rat: A microcomputed tomography study

Haruhisa Nakano, DDS, PhD,[a] Koutaro Maki, DDS, PhD,[b] Yoshinobu Shibasaki, DDS, PhD,[b] and Arthur J. Miller, PhD[c]
Tokyo, Japan, and San Francisco, Calif

A rapidly growing postnatal animal model was used to study changes in the calcified tissue of the mandibular condyle during altered muscle function. A maxillary occlusal splint was designed to shift the mandible laterally (left) during closure. Groups of 5 Wistar rats were killed at 5, 9, 15, 21, 30, and 40 weeks (n = 30), with an equal number of controls. The experimental animals developed shorter, asymmetrical mandibles compared with the control animals. The left condyle became larger and thicker than the right condyle. Microcomputed tomography assessment of the left and right condylar trabecular bone indicated that both had less bone volume than the control condyle. The right masseter muscle significantly lost fiber size and type IIA oxidative fibers, suggesting that the right masseter muscle was used with less tension development. In contrast, the left masseter maintained its fiber size and was similar to the control masseter fiber diameters. Comparison in the sequence of changes indicated that the morphologic changes occurred first in the ramus (age, 5 weeks), before the corpus (age, 15 weeks), and before changes in masseter fiber size and composition (age, 9 weeks). This study showed that both the mandible and the condyle modified their shape and size, as well as the trabecular bone of the condyle, during shifting of the mandible to one side as it closed. (Am J Orthod Dentofacial Orthop 2004;126:410-20)

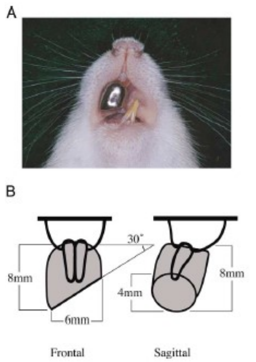


Fig 1. A, Metal alloy maxillary splint attached in 5-week-old rat. **B,** Splint was designed to cause mandible to shift to left side during incising. Mandibular incisor erupted during 40-week period of splint wear.

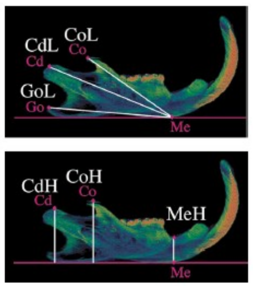


Fig 2. Morphologic measurements used to evaluate changes on left and right sides of mandible with linear measures. Mandibular length (*upper*) was evaluated 2 ways: length from condyle to menton (Cd–Me = CdL) and length from coronoid to menton (Co–Me = CoL). Length of mandibular corpus determined from gonion to menton (Go-Me = GoL). Height of ramus (*lower*) measured at posterior border (CdH) and at middle region (CoH) near coronoid. Height of anterior mandible measured at vertical distance from menton (MeH).

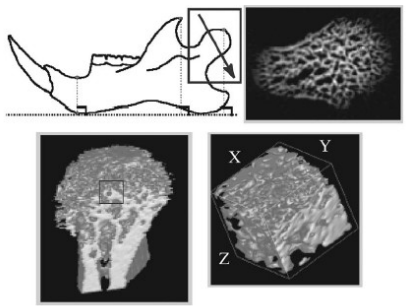
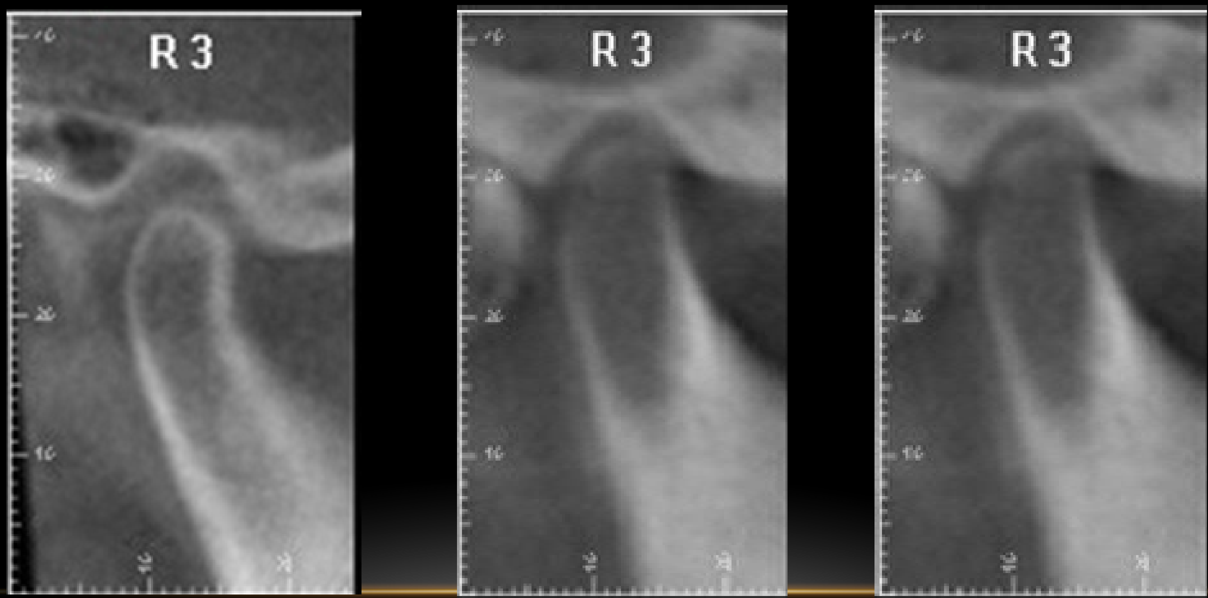
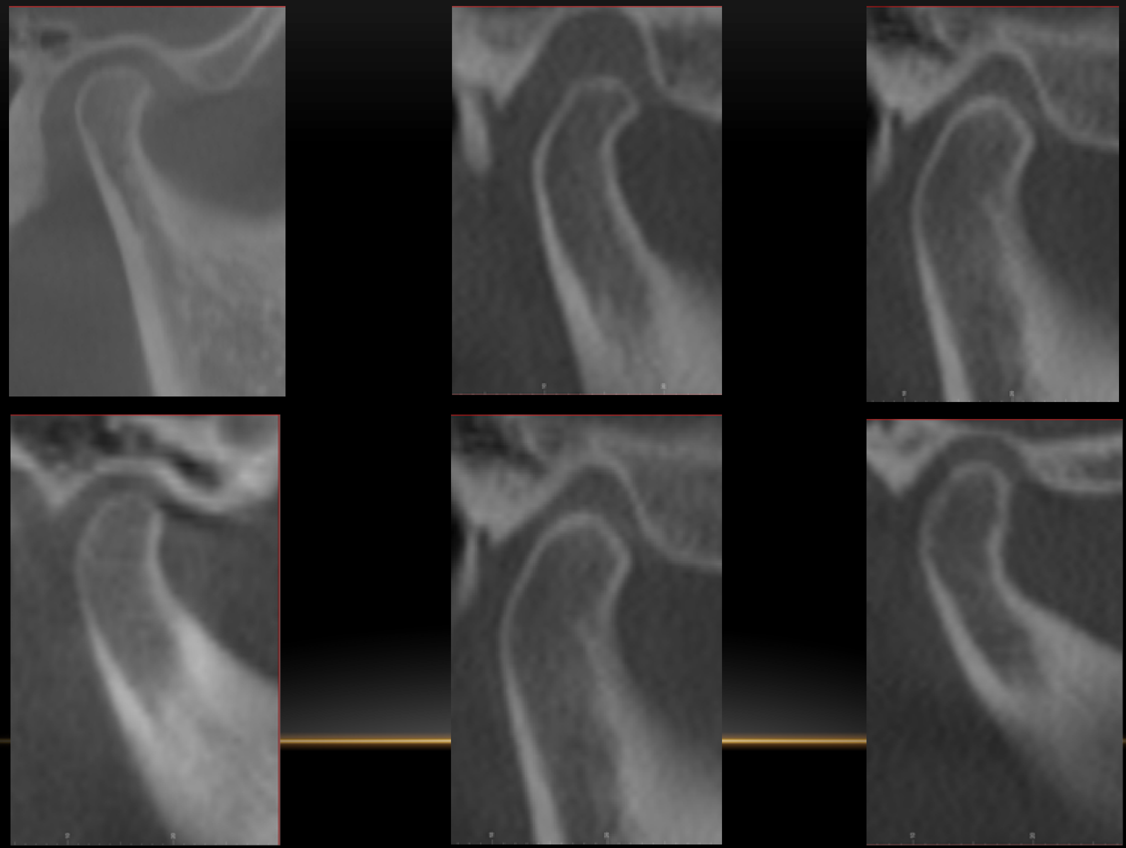


Fig 3. Above, Schematic view of lateral mandible and micro-CT view through condyle along particular plane. Below, Full view of condyle through diagonal plane, shown as micro-CT image. *Square* indicates region of interest in which volumetric sample (with X, Y, and Z axes) is analyzed for 8 measurements, including total volume, bone volume, bone volume fraction, bone surface, bone surface/bone volume, trabecular thickness, trabecular number, and trabecular separation.

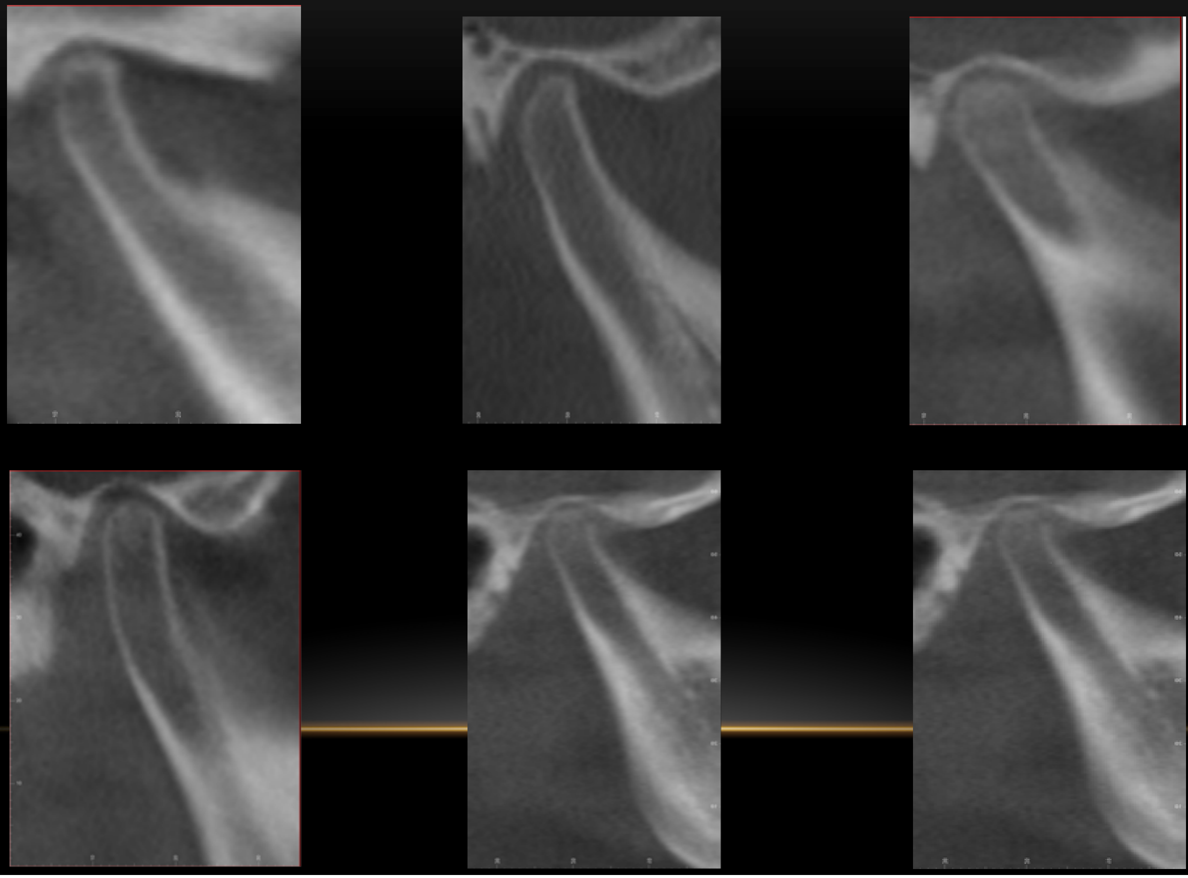
THE TMJ ANALYSIS HAS DEMONSTRATED THAT THE CONDYLES, WHILE SHOWING A VARIABLE SHAPE, ASSUME DIFFERENT CHARACTERISTICS DEPENDING ON THE SKELETAL CLASS. THE CONDYLES OF PATIENTS IN THE I CLASS HAVE A MORE REGULAR SHAPE :



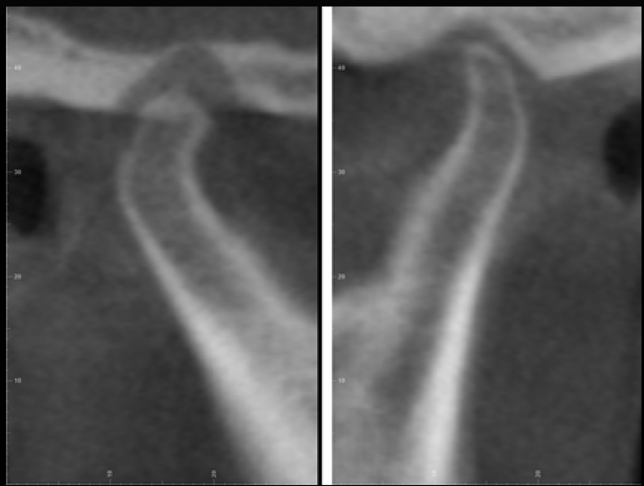
THE CONDYLES OF PATIENTS IN SKELETAL CLASS II HAVE A ROUNDED FORM AND HAVE A GREATER INCLINATION BETWEEN THE HEAD OF THE CONDYLE AND THE CONDYLE BRANCH, ALSO THE ARTICULAR FOSSA IS DEEPER:

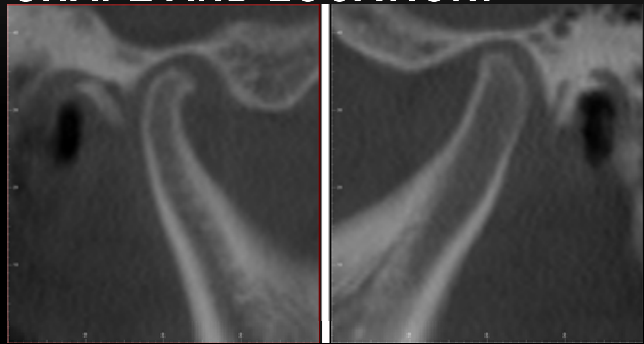


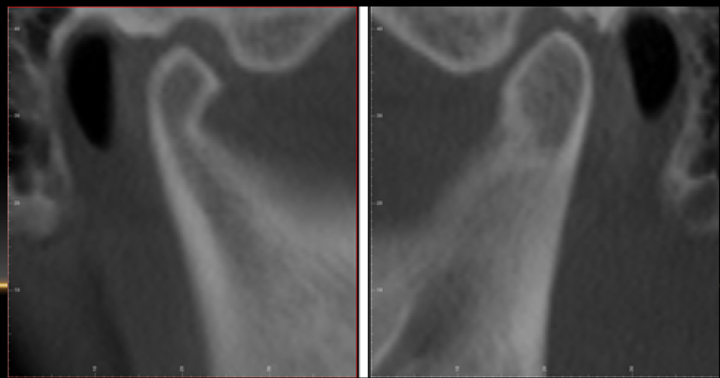
SKELETAL CLASS III PATIENTS HAVE MORE ELONGATED CONDYLE AND WIDER ARTICULAR FOSSA:



COMPARING THE RIGHT AND LEFT CONDYLES IN THE SAME PATIENT THERE IS OFTEN A CONSIDERABLE DIFFERENCE IN SHAPE AND LOCATION:



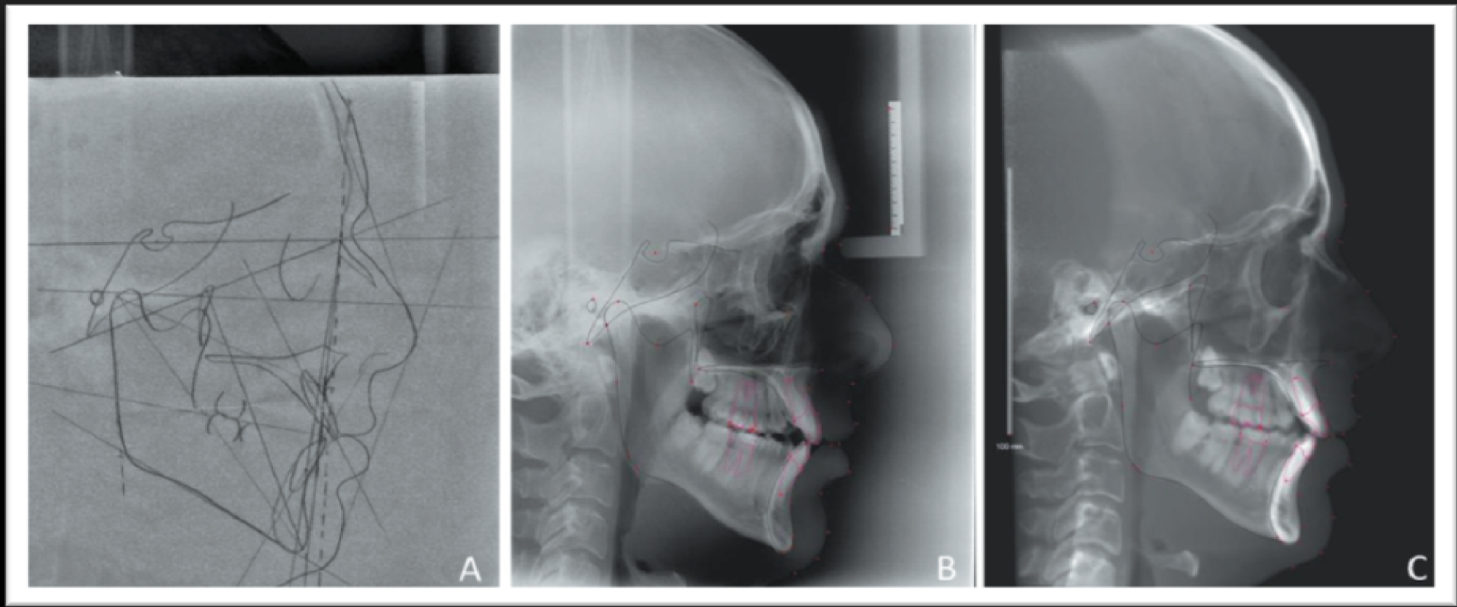




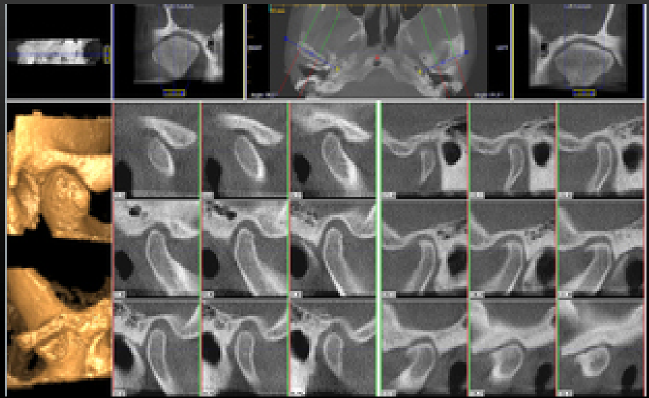
DOLPHIN IMAGING

- No image distortion
- No overlap
- 3D rendering 1: 1
- > resolution
- Storing and Retrieving rx
- Overlaying 2D and 3D facial photo
- Determination of the effects of surgical operations on soft tissues
- Improved communication with the patient

"3D CEPH-ANALYSIS"



- **Minimizing operator-dependent errors**
- **Saving of measurement time**
- **Simplicity and repeatability in identifying landmarks**
- **Picture enhancement of cephalometric image**
- **No loss of information**



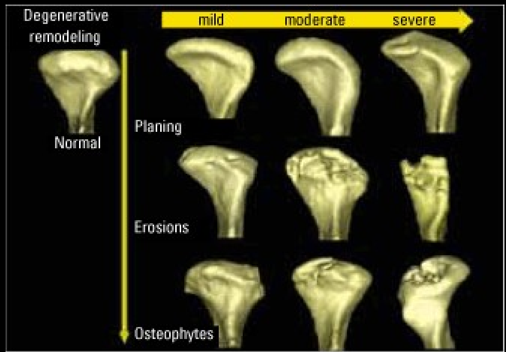
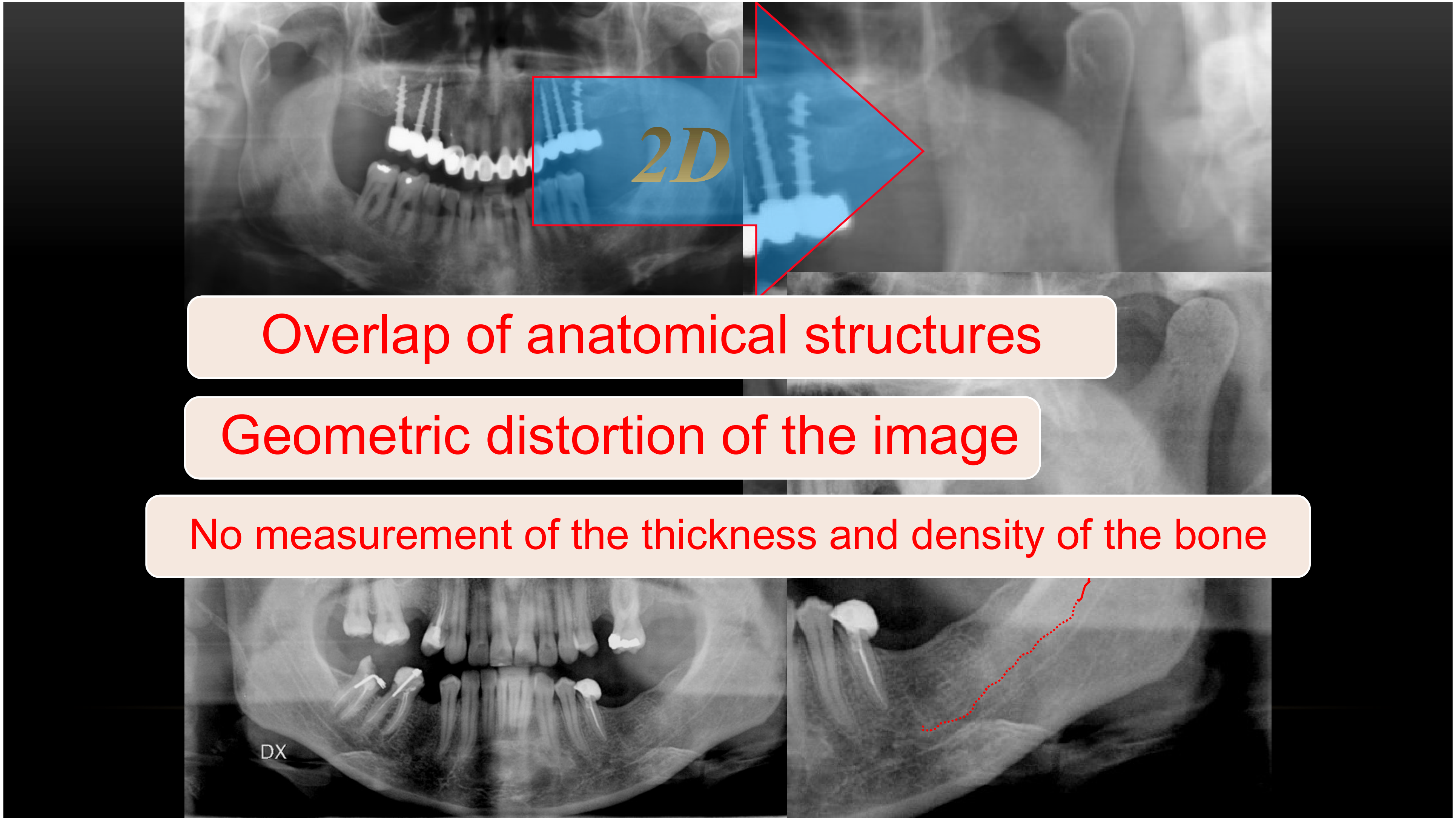
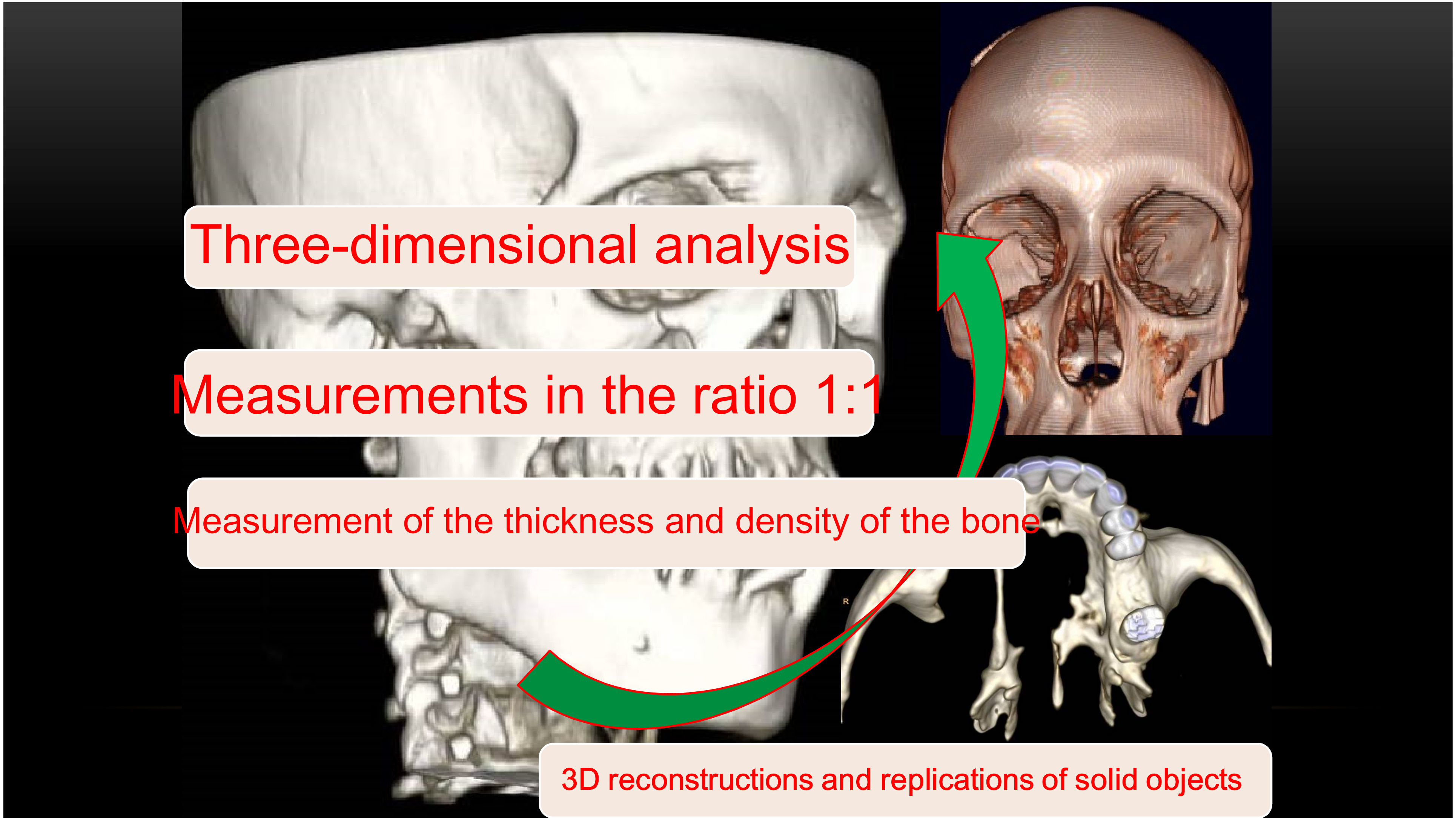


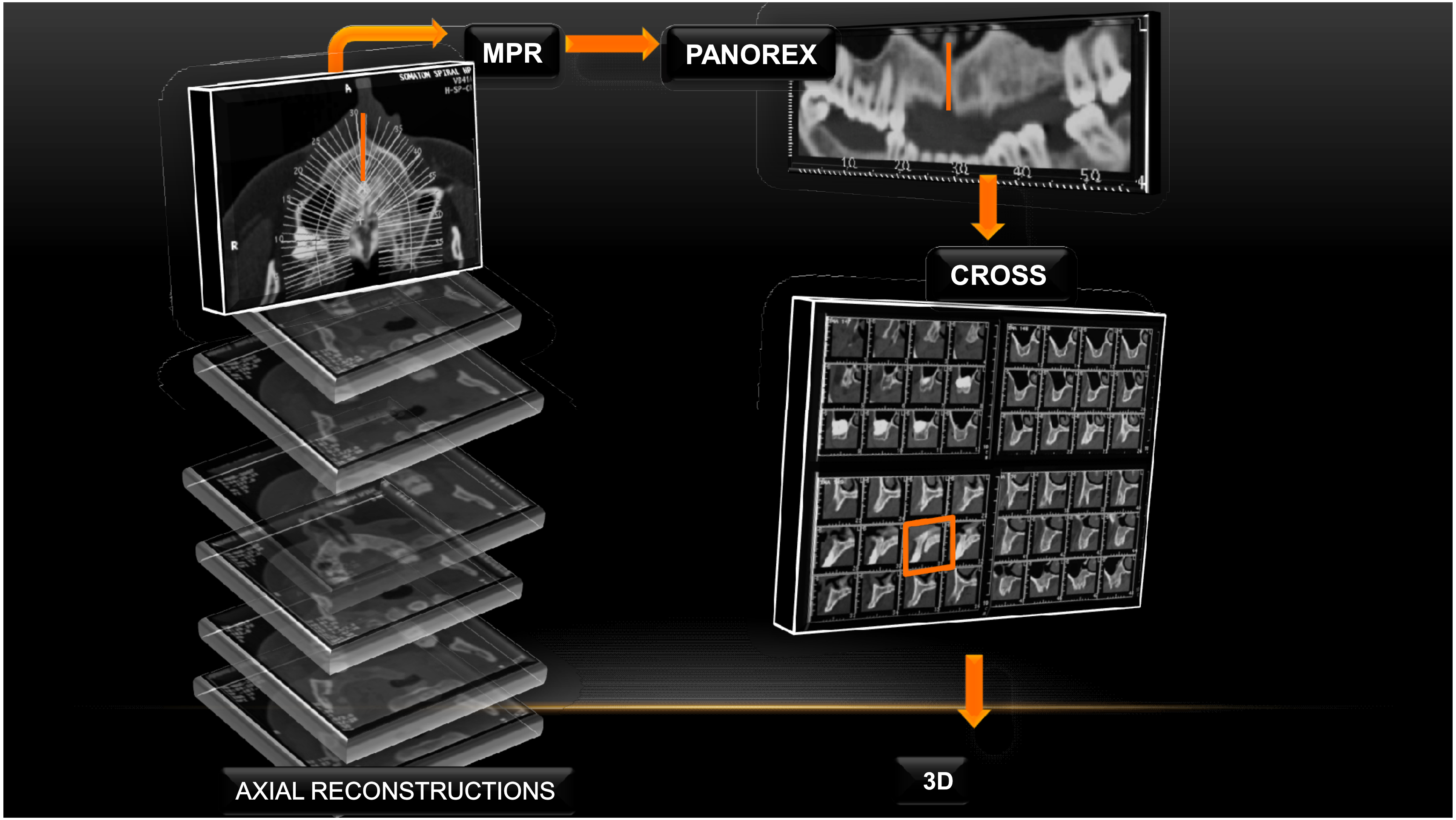
FIGURE 3 - Degenerative remodeling of the mandibular condyle in patients with TMD.

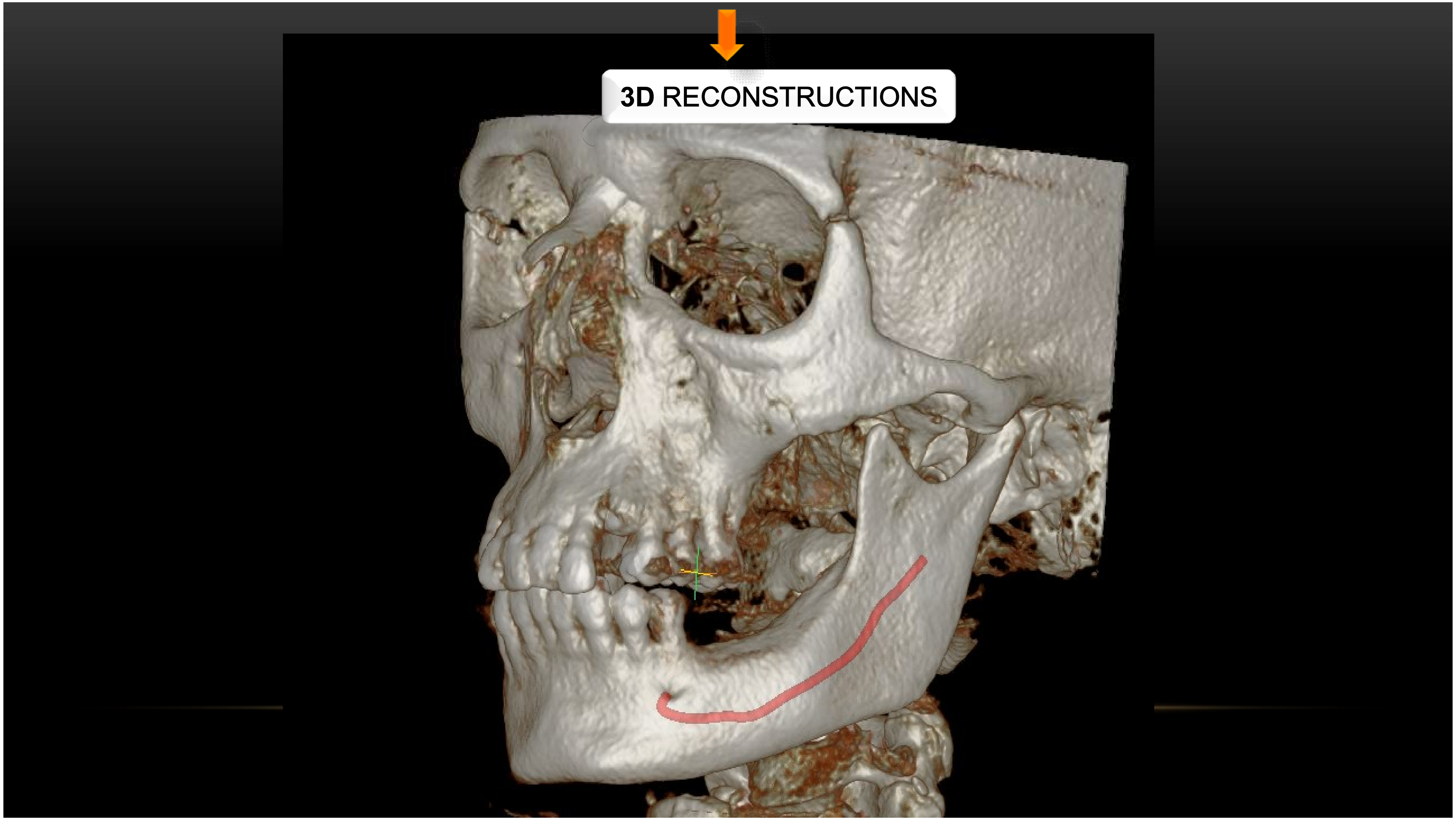
RESULTS CONFIRM THE USEFULNESS' CBCT IN THE STUDY OF VARIABLE THAT WAS NEVER POSSIBLE TO MEASURE UNTIL NOW, AND WE CONTINUE TO IMPROVE THIS LINE OF RESEARCH FOR BETTER UNDERSTANDING OF THE CONNECTIONS BETWEEN MORPHOLOGY AND FUNCTION IN THE ATM



2D
Overlap of anatomical structures
Geometric distortion of the image
No measurement of the thickness and density of the bone
DX

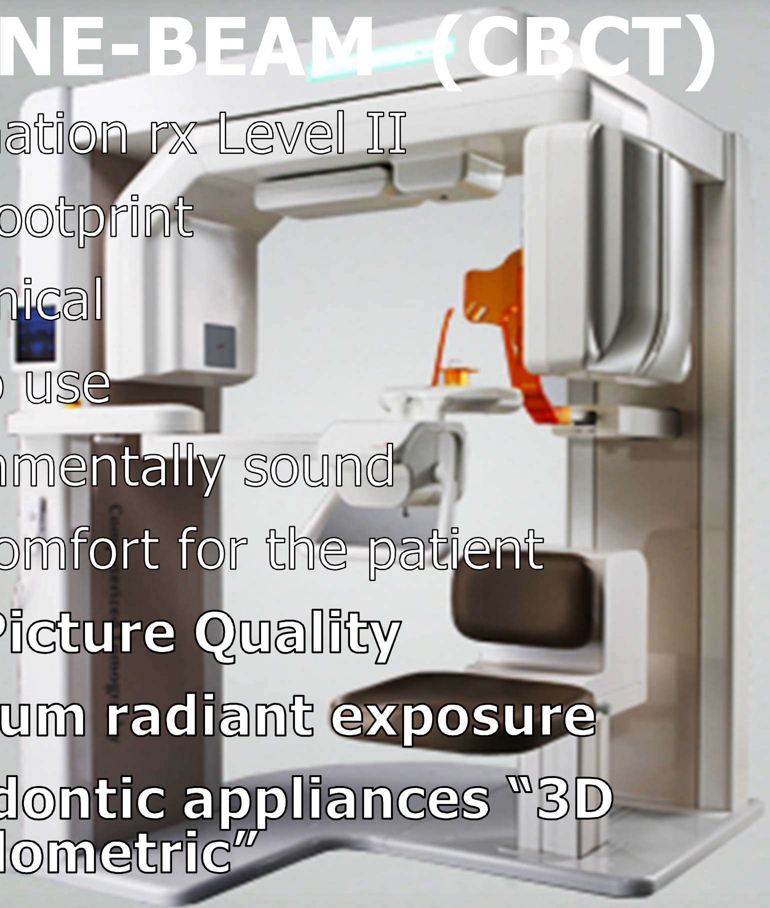

Three-dimensional analysis
Measurements in the ratio 1:1
Measurement of the thickness and density of the bone
3D reconstructions and replications of solid objects


MPR
PANOREX
CROSS
AXIAL RECONSTRUCTIONS
3D

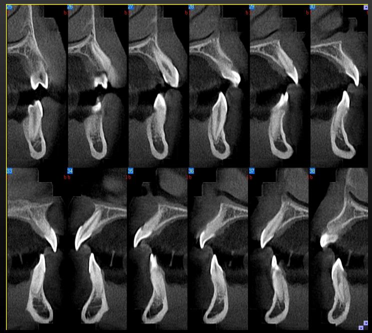

3D RECONSTRUCTIONS

TC CONE-BEAM (CBCT)

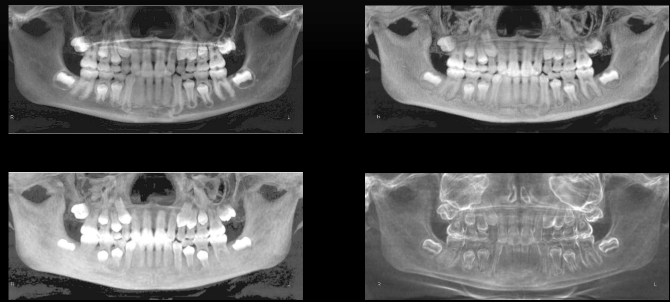
- Examination rx Level II
- Small footprint
- Economical
- Easy to use
- Environmentally sound
- More comfort for the patient
- **High Picture Quality**
- **Minimum radiant exposure**
- **Orthodontic appliances "3D cephalometric"**

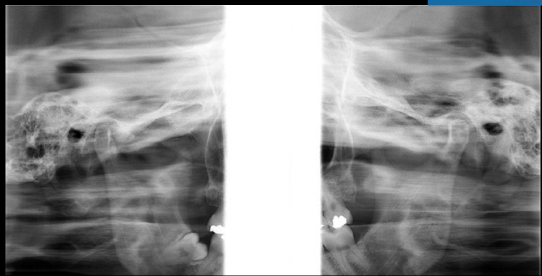


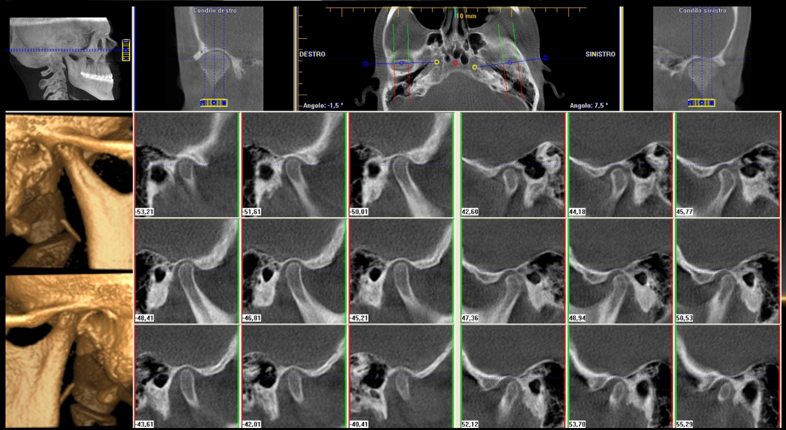
Pax Zenith 3D Vatech



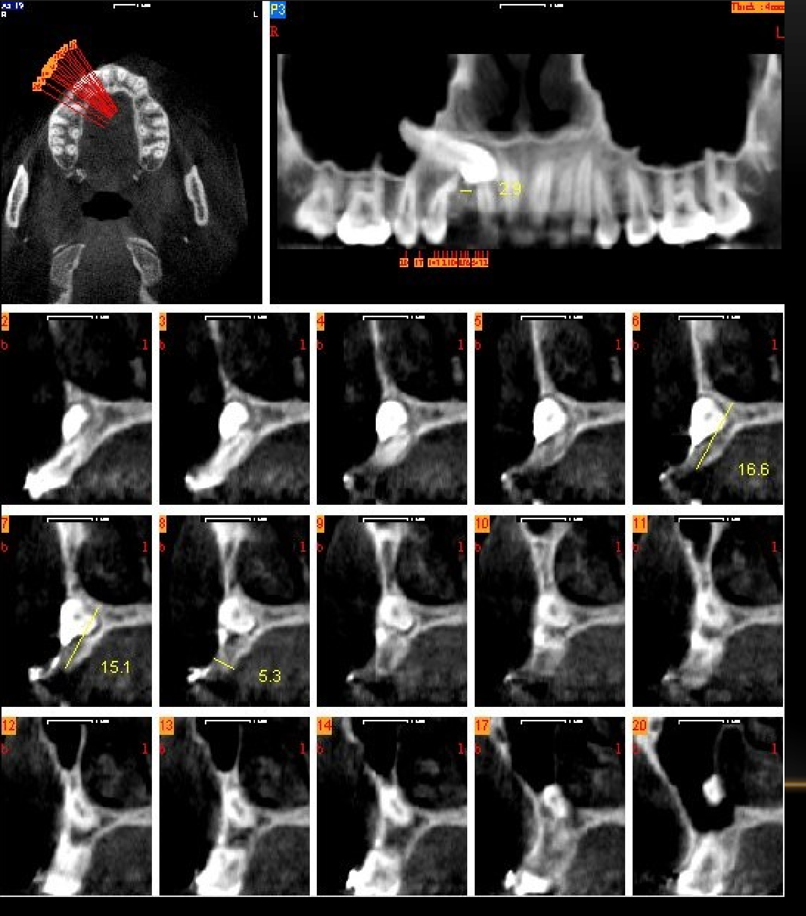
CBCT RECONSTRUCTIONS



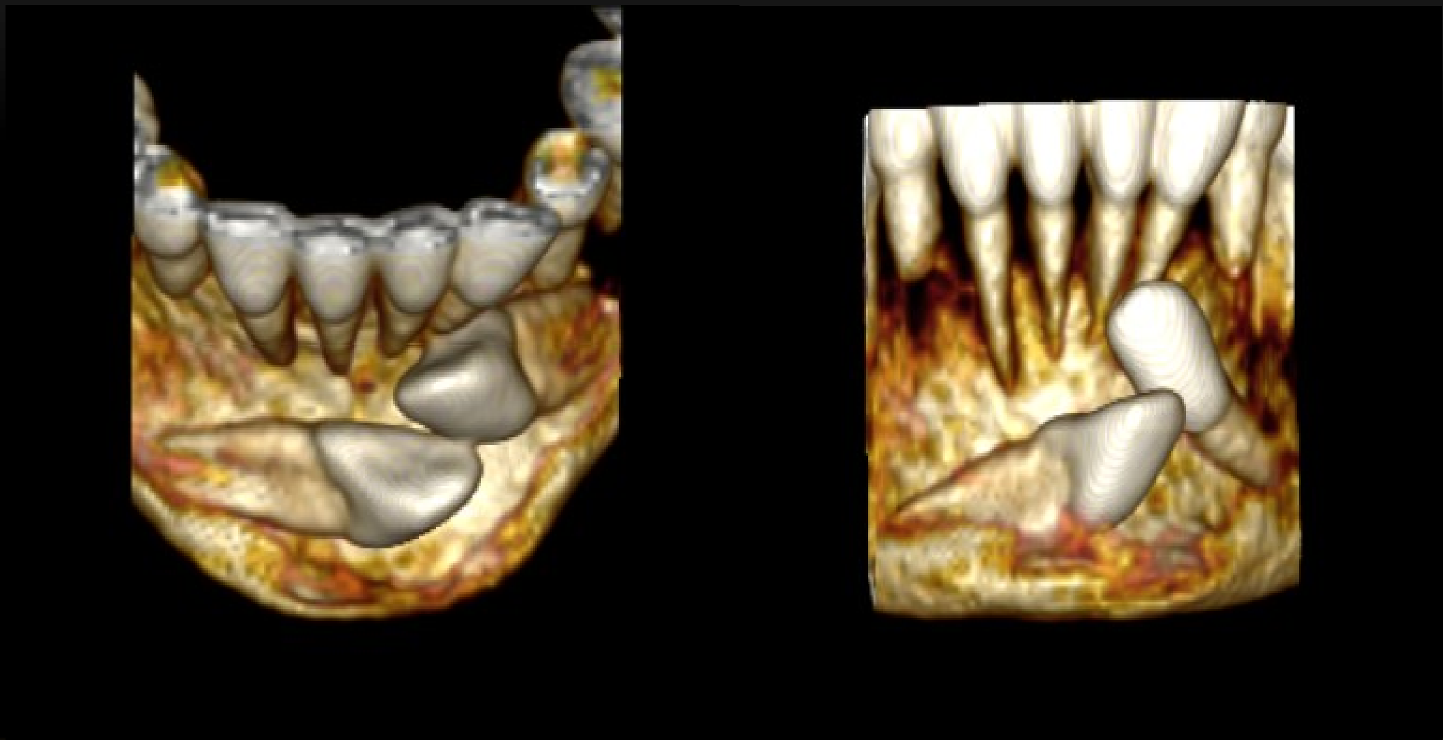




Impacted teeth



Impacted teeth



CBCT

Indications

- \- evaluation of periodontal support in periodontology
- \- verification of suspected lesions endodontics, apical and periapical
- \- anomalies of number, shape, location, structure, size, time of eruption and degenerative abnormalities
- **A.L.A.R.A.** (as low as reasonably achievable)
- \- presence of cysts or tumors of the jaws
- \- fractures of the jaw
- \- presurgical study of the elements included (position and shape of the roots, any disorders of the element)
- \- study pre- and post-implant
- \- orthodontic evaluation
- \- incidental findings
- \- study of ATM
- \- analysis of face

PubMed Search term

↓ Full text

Cone beam computed tomography for dental and maxillofacial imaging: technique improvement and low-dose protocols.

Feragalli B, et al. Radiol Med. 2017.

Authors

Feragalli B[1], Rampado O[2], Abate C[3], Macrì M[1], Festa F[1], Stromei F[4], Caputi S[1], Guglielmi G[5,6].

Author information

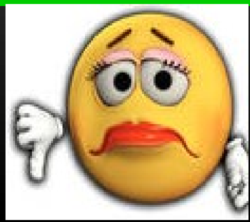
1 Department of Medical, Oral and Biotechnological Sciences, University G. D'Annunzio, Via dei Vestini, 66100, Chieti, Italy.
2 Complex Structure Medical Physics, Scientific Institute Hospital "Città della Salute e della Scienza", C.so Bramante, 88, 10126, Turin, Italy.
3 Department of Radiology, University of Foggia,

approximately 40% (628 mGy cm2); this protocol resulted in a value of effective dose of 35 microSievert (μSv). Moreover, the effect of changing FOV has been evaluated, considering two scans with a reduced FOV (160 × 140 and 120 × 90 mm, respectively).

CONCLUSIONS: CBCT low-dose protocol with large FOV, normal resolution quality images, 80 kVp, 5 mA and acquisition time of 15 s resulted in a value of effective dose of 35 microSievert (μSv). This protocol allows the study of maxillofacial region with high quality of images and a very low radiation dose and, therefore, could be proposed in selected case where a complete assessment of dental and maxillofacial region is useful for treatment planning.

PMID: 28365888 [Indexed for MEDLINE]

CBCT



RADIATION DOSE

The aim of our study was to compare low-dose CBCT protocols with conventional panoramic and cephalometric imaging regarding images quality and radiation doses.

Traditional RX < CBCT << TAC DENTAL SCAN

The use of cone-beam computed tomography in dentistry: an advisory statement from the American Association Council on Scientific Affairs JADA 2012; 143(8):899-902

Guidelines for the use of radiographs in clinical orthodontics British Orthodontic Sciety 2008

Clinical recommendations regarding use of cone beam computed tomography in orthodontic treatment. Position statement by the America Academy of Oral and Maxillofacial Radiology Oral Surg Med Oral Pathol Oral radiol 2013 116(2):238-57

SEDENTEXCT project. Radiation protection: cone beam CT for dental and maxillofacial radiology. Evidence-based guidelines 2011

CBCT

RADIATION DOSE ????

Methods: Dose measurements of different acquisition protocols were calculated for Pax Zenith 3D Cone Beam (Vatech, Korea) and for OPT Ortophos (Sirona Dental Systems, Bernsheim, Germany). The absorbed organ doses were measured by using an anthropomorphic phantom loaded with thermoluminescent dosimeters at 58 sites related to sensitive organs in order to have a good sampling for all the involved organs at risk (bone marrow, bone surface, brain, salivary glands, thyroid, oral mucosa, extrathoracic airway, esophagus and lymph nodes). Five different CBCT protocols were evaluated for image quality and radiation doses. Measurements were then carried out with orthopantomograph. Equivalent and effective doses were calculated. The calculation of the effective doses was based on the International Commission on Radiological Protection's 2005 recommendations.

Traditional RX < CBCT << TAC DENTAL SCAN

BIOLOGICAL IMPACT
SIEVERT

- **The Sievert (Sv) is the unit of equivalent dose of radiation in the International System and it measures the effects and damage caused by the radiation of a body**

- **In addition to the Sievert are used submultiples**

millisievert (mSv, 1 Sv = 1.000 mSv)
microsievert (μSv, 1 Sv=1.000.000 μSv)

CBCT

Were performed dose measurements in terms of dose area product (DAP) for the equipment CBCT Vatech Pax Zenith 3D e OPT Ortophos Siemens, for different protocols of acquisition. For the CBCT equipment also assessments have been made of effective dose and the organs at a relatively low dose protocol.

Compare the values of effective dose between traditional examinations and 3D

- Pax Zenith 3D Vatech
- OPT Ortophos Siemens

RESULTS

- The measures of DAP were performed by placing a transmission ionisation chamber in correspondence of the output window of the X-ray tube.

ID protocol	FOV size selection	Quality selection	kVp	mA	DAP (display) mGy·cm^2	DAP (media misure) mGy·cm^2	Diff %	Acquisition TIME (sec.)	NOTE
1	240x190	high resolution	95	5	1837	1556	18.1	24	(prot. riferimento)
1-bis	240x190	high resolution	80	5	1761	1013	73.8	24	
1-ter	240x190	normal resolution	80	5	1093	628	74.2	15	(prot. bassa dose)
2	160x140	high resolution	95	5	117.9	988	-88.1	24	
2-bis	120x90	high resolution	95	5	0 ?	1162	-	24	

The low-dose protocol :(Large FOV, normal resolution quality images, 80 kVp, 5 mA and acquisition time of 15 sec): decrease in the dose of approximately 40%, with a value of 628 mGy cm2, equal to 40% of the value obtained with the reference protocol

DAP value mGy·cm^2 OPT Ortophos Siemens

The measures of DAP were performed by placing a transmission ionisation chamber in correspondence of the output window of the X-ray tube.

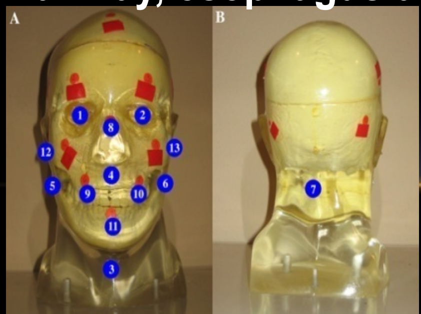
Acquisition	PROTOCOL	kVp	mA	Acquisition Time (s)	DAP (media measure) mGy·cm^2
Panoramic	Adult	71	8	13	36
	Pediatric	60	6	13	19
Lateral projections	Adult	84	13	16	47
	Pediatric	73	15	16	40
Antero-posterior projections	Adult	84	13	16	40
	Pediatric	73	15	16	35
TOTAL	Adult	84	13	16	123
	Pediatric	73	15	16	94

Value of the effective dose µSv CBCT

- **protocol 1 – ter:** chosen for orthodontic treatment planning was that with large FOV but low-dose
- assessments of effective dose and dose to organs have been carried out

Evaluations of effective dose were made with an Alderson Rando anthropomorphic dummy, by placing in the internal seats of measures radiochromic film strips measuring 4 mm x 25 mm.

58 locations have been used for the measurements, in order to have a good sampling for all the involved organs at risk (bone marrow, bone surface, brain, salivary glands, thyroid, oral mucosa, extrathoracic airway, esophagus and lymph nodes)



15 acquisitions repeated were made, so as to obtain values of absorbed dose compatible with the sensitivity of radiochromich film, even for peripheral sites affected by scattered radiation

Value of the effective dose µSv CBCT

Organ	Dose equivalent (µSv)
Marrow	*44*
Bone	*205*
Brain	*231*
Salivary Glands	*467*
Thyroid	*327*
Esophagus	*42*
Respiratory	*195*
Limph nodes	*57*
Oral Mucosa	*448*

Applying the weight coefficients defined in the ICRP 103 [1] a value of the effective dose of **35. 4 mSv** has been obtained.

The cumulative effective dose of conventional digital panoramic and cephalometric images resulted in a value of the effective dose ranging from 8 to more than 26 µSv.

1. ICRP Publication 103 'The 2007 Recommendations of the International Commission on Radiological Protection' Annals of the ICRP Volume 37/2-4, 2008

CBCT

Conclusion

CBCT offers significant advantages in the evaluation of the patient undergoing orthodontic treatment

CBCT is ALWAYS preferable to CT fan beam especially for the significant reduction of radiation dose

CBCT should be done using the protocol for obtaining diagnostic images with the lowest radiation dose to the patient

CBCT performed with low-dose protocol has a very low radiation exposure and, therefore, could be proposed as the primary method in orthodontic treatment planning resembling Conventional Imaging.

References

Feragalli, B., Rampado, O., Abate, C., Macrì, M., Festa, F., Stromei, F., ... & Guglielmi, G. (2017). Cone beam computed tomography for dental and maxillofacial imaging: technique improvement and low-dose protocols. *La radiologia medica*, *122*(8), 581-588.

White SC. Cone-beam imaging in dentistry. Health Phys. 2008;95:628-37.

[2] Fu KY, Zhang WL, Liu DG, Chen HM, Ma XC. Cone beam computed tomography in the diagnosis of temporomandibular joint Osteoarthrosis. Zhonghua Kou Qiang Yi Xue Za Zhi. 2007;42:417-420.

[3] Alexiou K, Stamatakis H, Tsiklakis K. Evaluation of the severity of temporomandibular joint osteoarthritic changes related to age using cone beam computed tomography. Dentomaxillofac Radiol. 2009;38:141-147.

[4] Meng JH, Zhang WL, Liu DG, Zhao YP, Ma XC. Diagnostic evaluation of the temporomandibular joint osteoarthritis using cone beam computed tomography compared with conventional radiographic technology. Beijing Da Xue Xue Bao. 200739:26-29.

[5] Cevidanes LHS,Bailey LTJ,Tucker SF,Styner MA,Mol A,Phillips CL, Proffit WR, Turveyh T. Three-dimensional cone-beam computed tomography for assessment of mandibular changes after orthognathic surgery. Am J Orthod Dentofac Orthop 2007;131:44-50.

[6] Berna L, and Kansu O. Trifid mandibular condyle: A case report. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003;95:251-254.

[7] Hussain AM, Packota G, Major PW, Flores-Mir C. Role of different imaging modalities in assessment of temporomandibular joint erosions and osteophytes: a systematic review. Dentomaxillofac Radiol. 2008;37:63-71. [8] Chirani RA, Jacq J-J, Meriot P, Roux C. Temporomandibular joint: A methodology of magnetic resonance imaging 3-D reconstruction. Oral and Maxillofacial Radiology. 2004;97:756-761.

[9] Honey OB, Scarfe WC, Hilgers MJ, Klueber K, Silveira AM, Haskell BS, Farman AG. Accuracy of cone-beam computed tomography imaging of the temporomandibular joint: comparisons with panoramic radiology and linear tomography. Am J Orthod Dentofacial Orthop. 2007;132:429-438. [10] Brian Schluetera; Ki Beom Kimb; Donald Oliverc; Gus Sortiropoulosd. Cone Beam Computed Tomography 3D Reconstruction of the Mandibular Condyle

Angle Orthod. 2008;78:880-888.

[11] Hilgers ML, Scarfe WC, Scheetz JP, Farman AG. Accuracy of linear TMJ measurements with cone beam computed tomography and digital cephalometric radiography. Am J Orthod Dentofacial Orthop. 2005;127:803–811.

[12] Periago DR, Scarfeb WC, Moshiric M, Scheetzd JP,Silveira AM,Farman AG. Linear Accuracy and Reliability of Cone Beam CT Derived 3-Dimensional Images Constructed Using an Orthodontic Volumetric Rendering Program. Angle Orthod. 2008;78:387-395.

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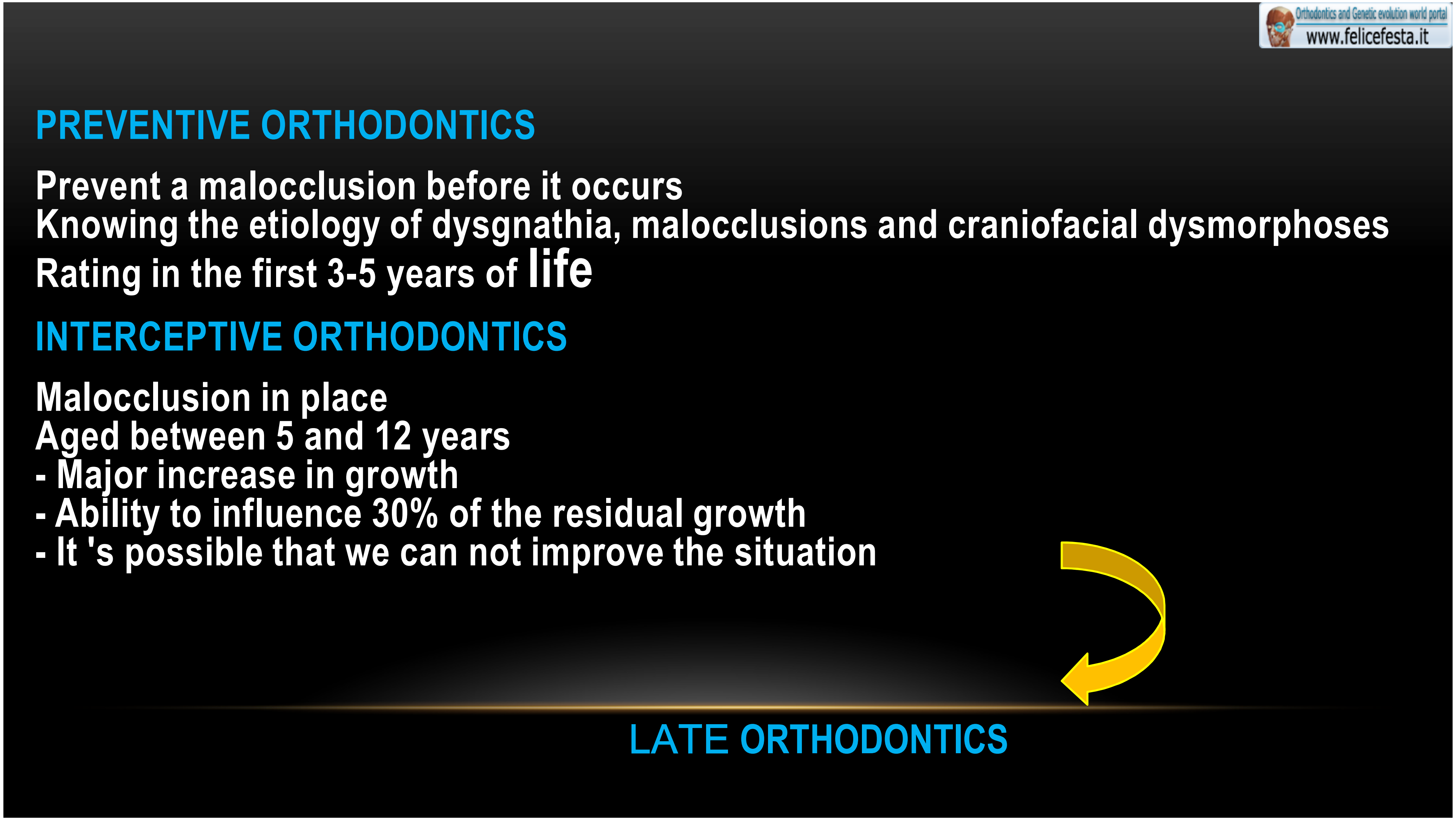
ORTHOPAEDIC AND 3D FUNCTIONAL THERAPY

- Frankel Function Regulator
- TMD in children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PREVENTIVE ORTHODONTICS
Prevent a malocclusion before it occurs
Knowing the etiology of dysgnathia, malocclusions and craniofacial dysmorphoses
Rating in the first 3-5 years of life
INTERCEPTIVE ORTHODONTICS
Malocclusion in place
Aged between 5 and 12 years
- Major increase in growth
- Ability to influence 30% of the residual growth
- It 's possible that we can not improve the situation
LATE ORTHODONTICS

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PURPOSE OF INTERCEPTIVE TREATMENT

- Correcting imbalances of skeletal, dental or muscle to improve the environment before full eruption of the permanent teeth
- Minimize the need for subsequent, more complex treatments (extractions, orthognathic surgery)

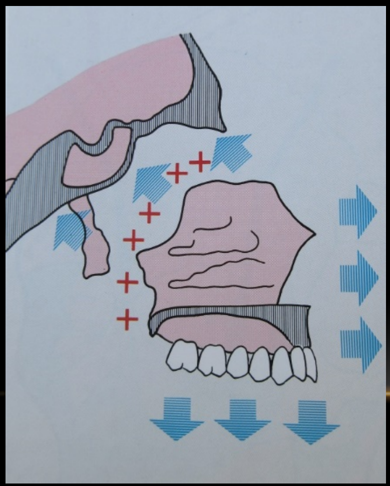
ORTHOPAEDIC AND 3D FUNCTIONAL THERAPY

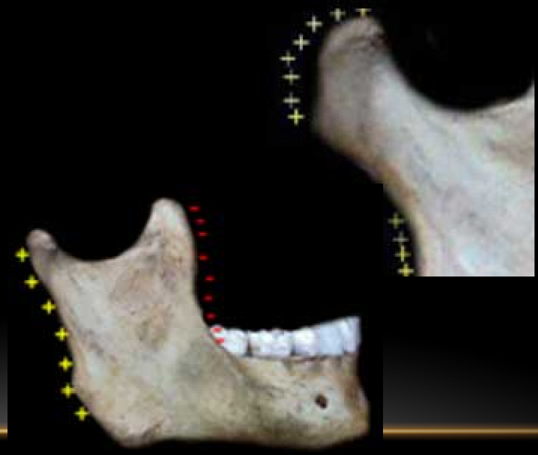
- Frankel Function Regulator
- TMD in children

FRANKEL FUNCTION REGULATOR

MECHANISMS OF ACTION

1. **MUSCULAR ACTIVATION AND STRETCH SOFT TISSUE:** tissue viscoelasticity (potential energy) and muscle contraction (kinetic energy)
2. **MANDIBULAR DISPLACEMENT AND ACTIVATION OF SOFT TISSUE** resulting in induction of stimuli that act on osteogenic tissue (membranous bone growth) and on cartilage (endochondral bone growth)





2D 3D TRANSITION

Diagnosis 3D Clinical Chart/ conebeam lowdose/ Condyle in center of glenoid fossa /cervical lordosis/ genetic arch form/cortical plates centered roots/ Root resorption/ Masseter-Sternolcledomastoideus Lenght-Width

Treatment 2D Treatment/3D VTO/3D Clincheck/ 3D Treatment

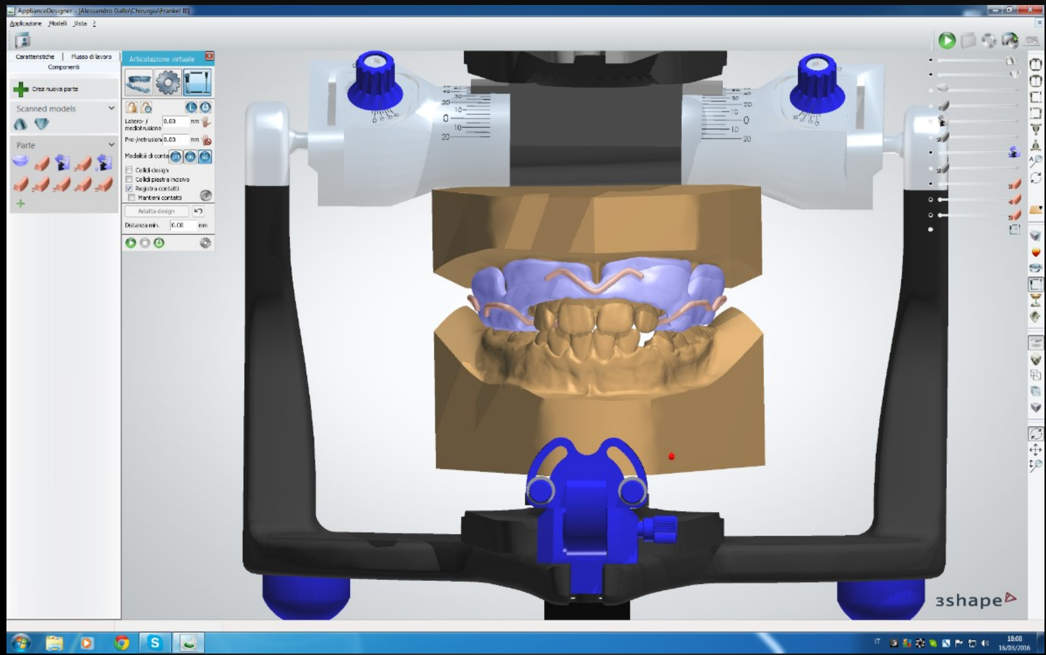
Appliances 3DFrankel/Fixed Appliance/Removable Appliance/Indirect Bonding/Implant Studio for Ortho Solution/Lingual Arch/TPA Arch/Tongue thrusting appliance/Retainer Appliance/Hyrax Appliance/Herbst Appliance/Forsus Appliance Design/Twin Block/Surgical Splint/IDB V2

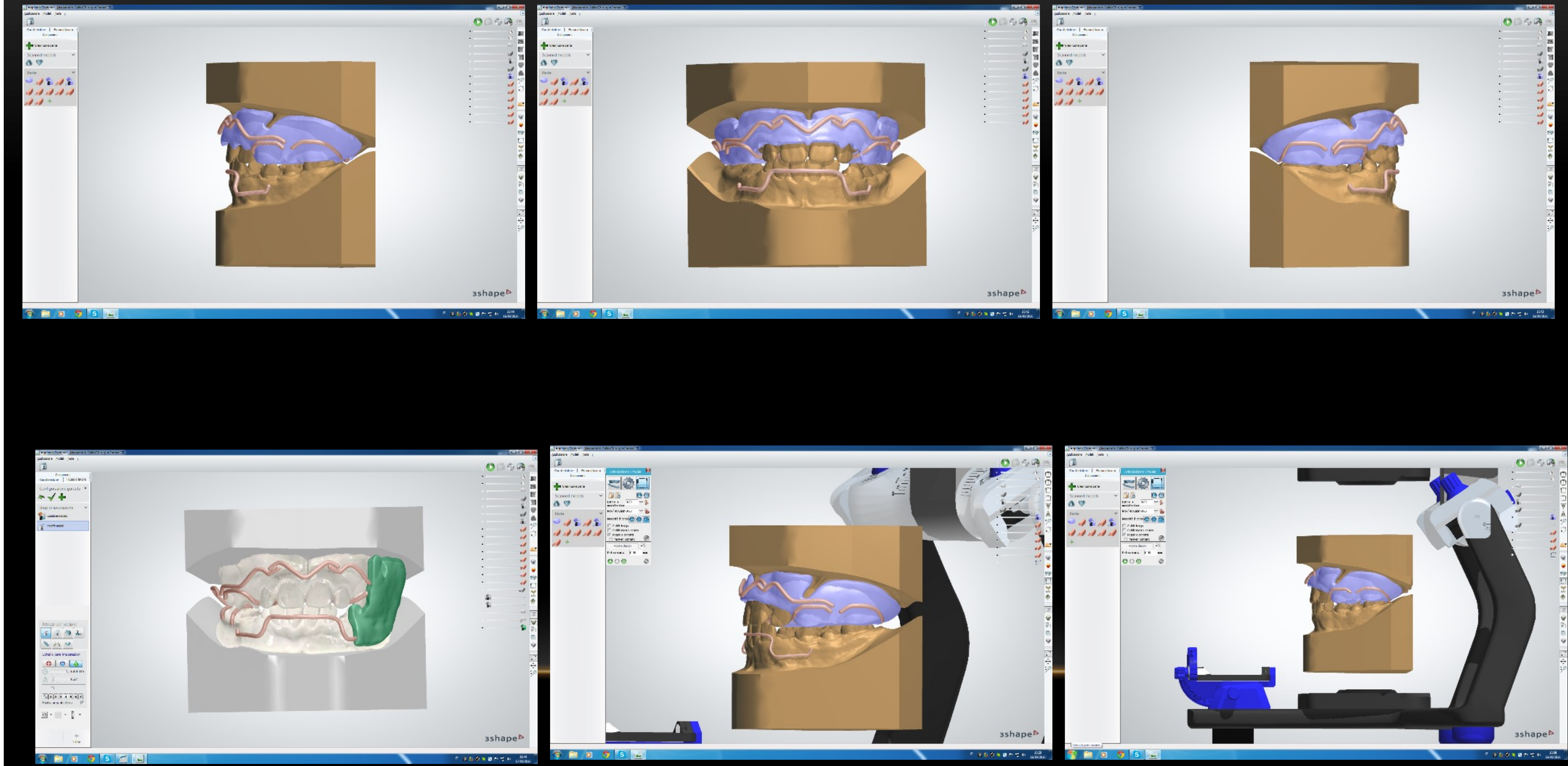
FRANKEL FUNCTION REGULATOR

Therapeutic indications:

- Correction alveolar dental malformations
- Skeletal deformities and alveolar process correction
- Retrognathia
- Skeletal deep bite
- Skeletal open bite
- Prognathism

3D FRANKEL FUNCTION REGULATOR

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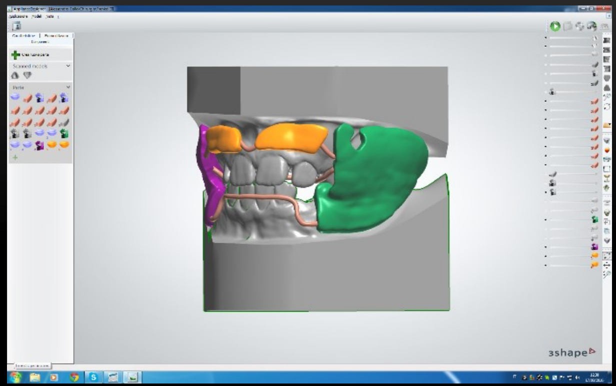

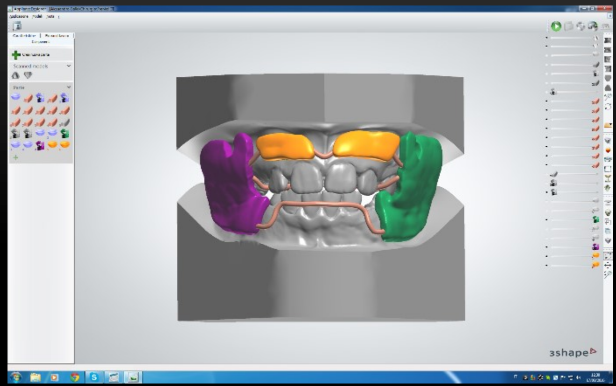

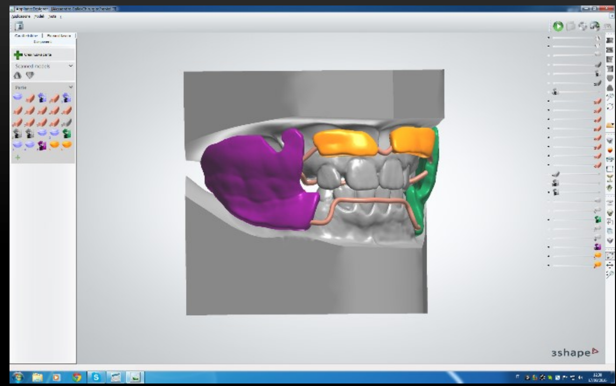

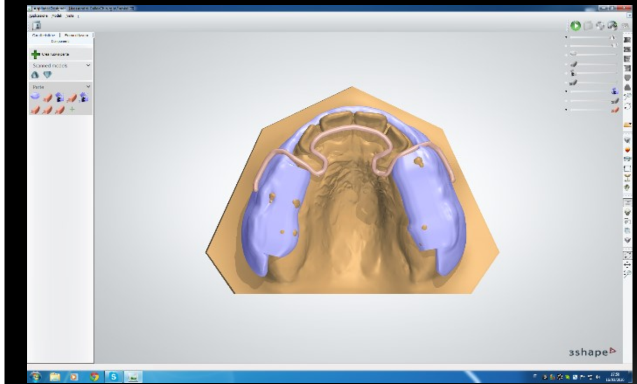

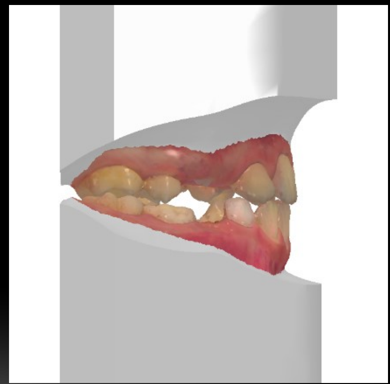

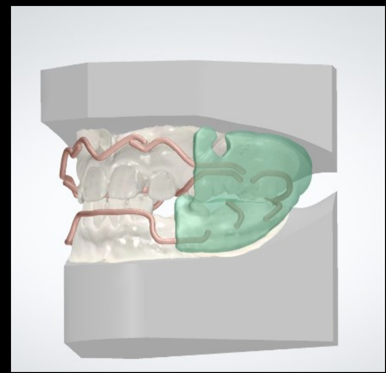

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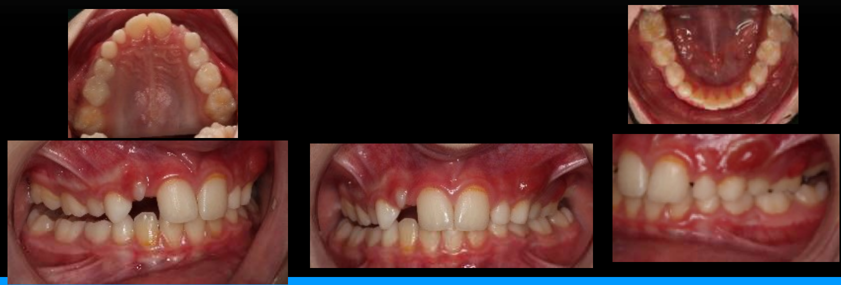
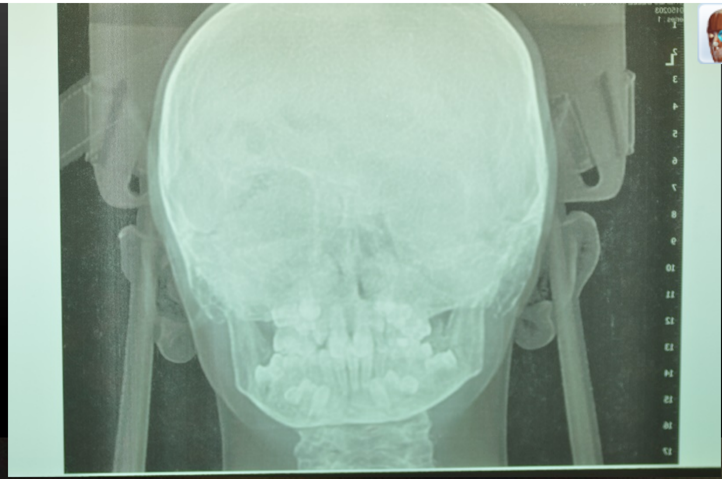


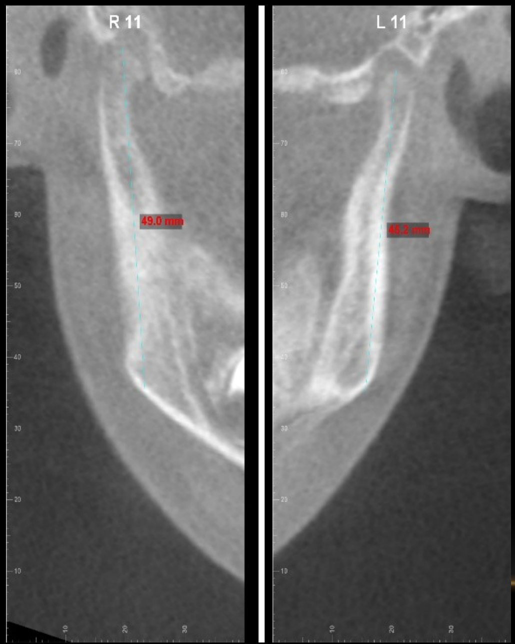
Case 1: Class II, Deep Bite,Right Mandible Ramus Hyperplasia, Frankel Function Regulator

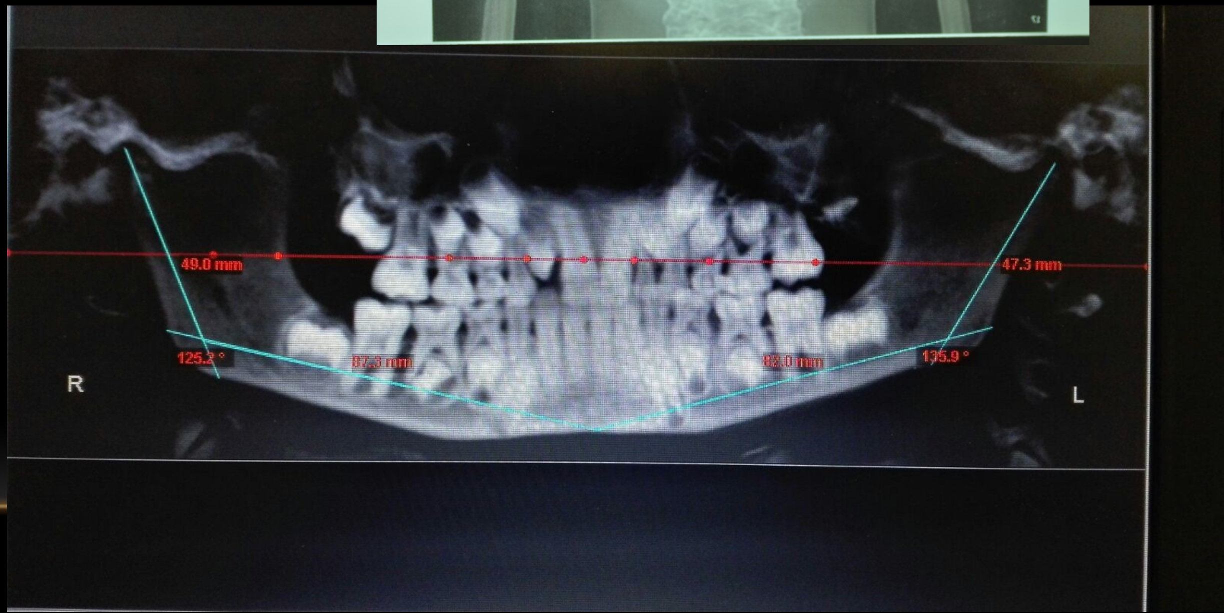
Age:10 years

12 months Frankel Function Regulator

MEASUREMENTS 2015







Frankel Function Regulator

This is a case of hemi mandible HYPERPLASIA that, according to our classification, has a right mandibular branch with increased growth at the bottom, a corner gonial more closed, the right condyle retrusive and higher than the left, and a deviation ipsilateral of the midline

MODIFIED FRANKEL FUNCTION REGULATOR WITH A DISTRACTION SPRING

- The construction bite was taken without providing the correction of the midline to avoid unwanted condylar displacements and intracapsular diseases

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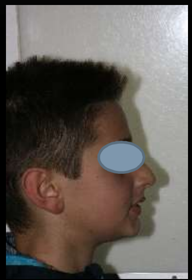
AFTER A YEAR OF TREATMENT






The thesis work was developed by **Dr. E. Tamburri**

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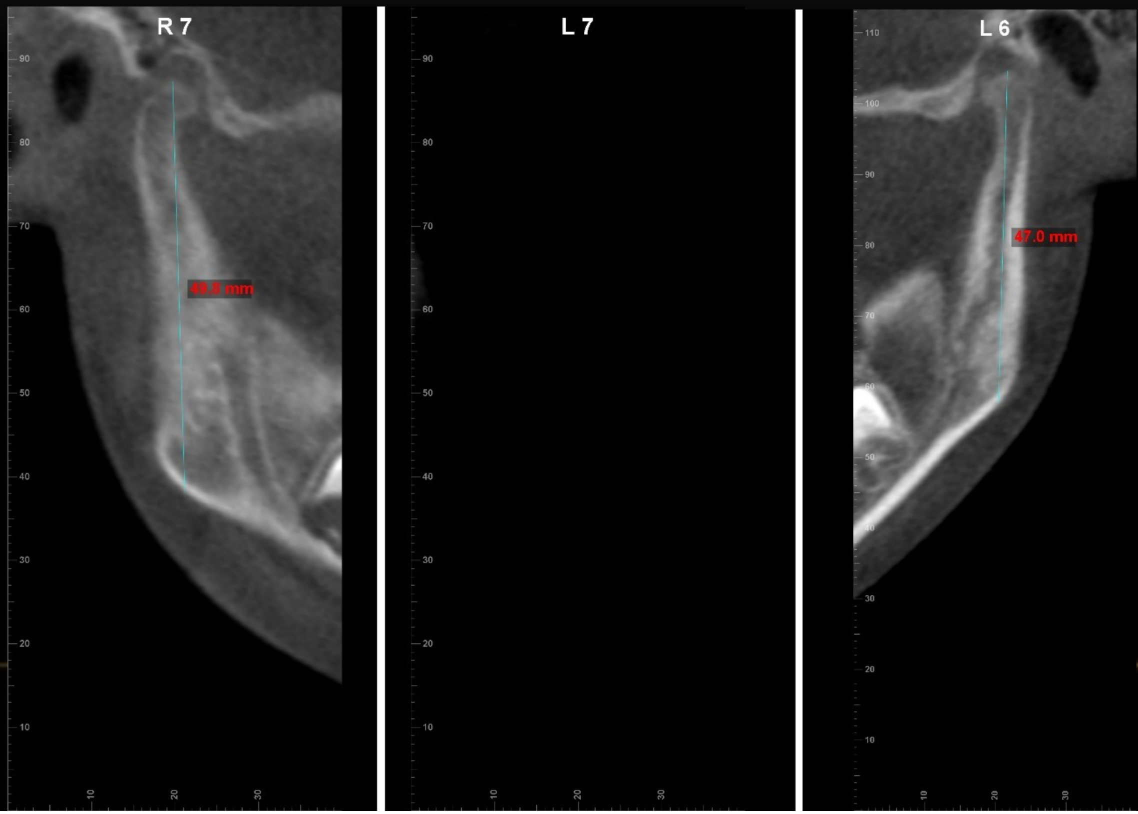
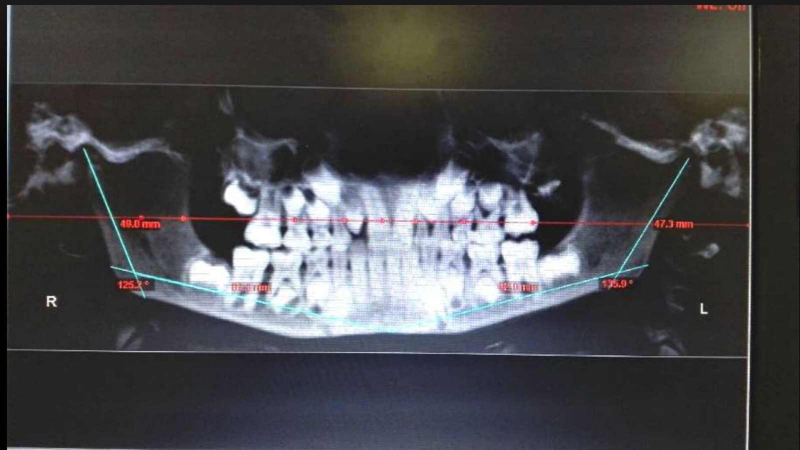
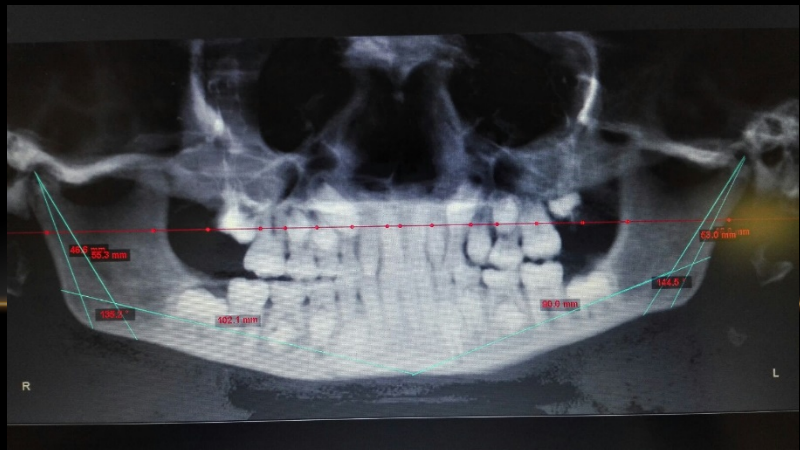
MANDIBULAR BRANCHES 2016



Pre and post treatment





FRANKEL FUNCTION REGULATOR

- In a year of treatment there were positive results. The left hemimandible has grown more than hypertrophic right
- The vestibular shields along the upper lip bumper have enabled a greater maxillary development, allowing a mandibular anterior translation with a significant improvement in aesthetics and functionality, as well as in the inclination of the upper incisors. Such anterior translation of the jaw has improved the curvature of the cervical spine, which we know to be important for the postural purposes and to avoid the onset of headaches muscle-tensive, limiting the inversions of the column to which it is subject in cases of mandibular retrusion.

ORTHOPAEDIC AND 3D FUNCTIONAL THERAPY

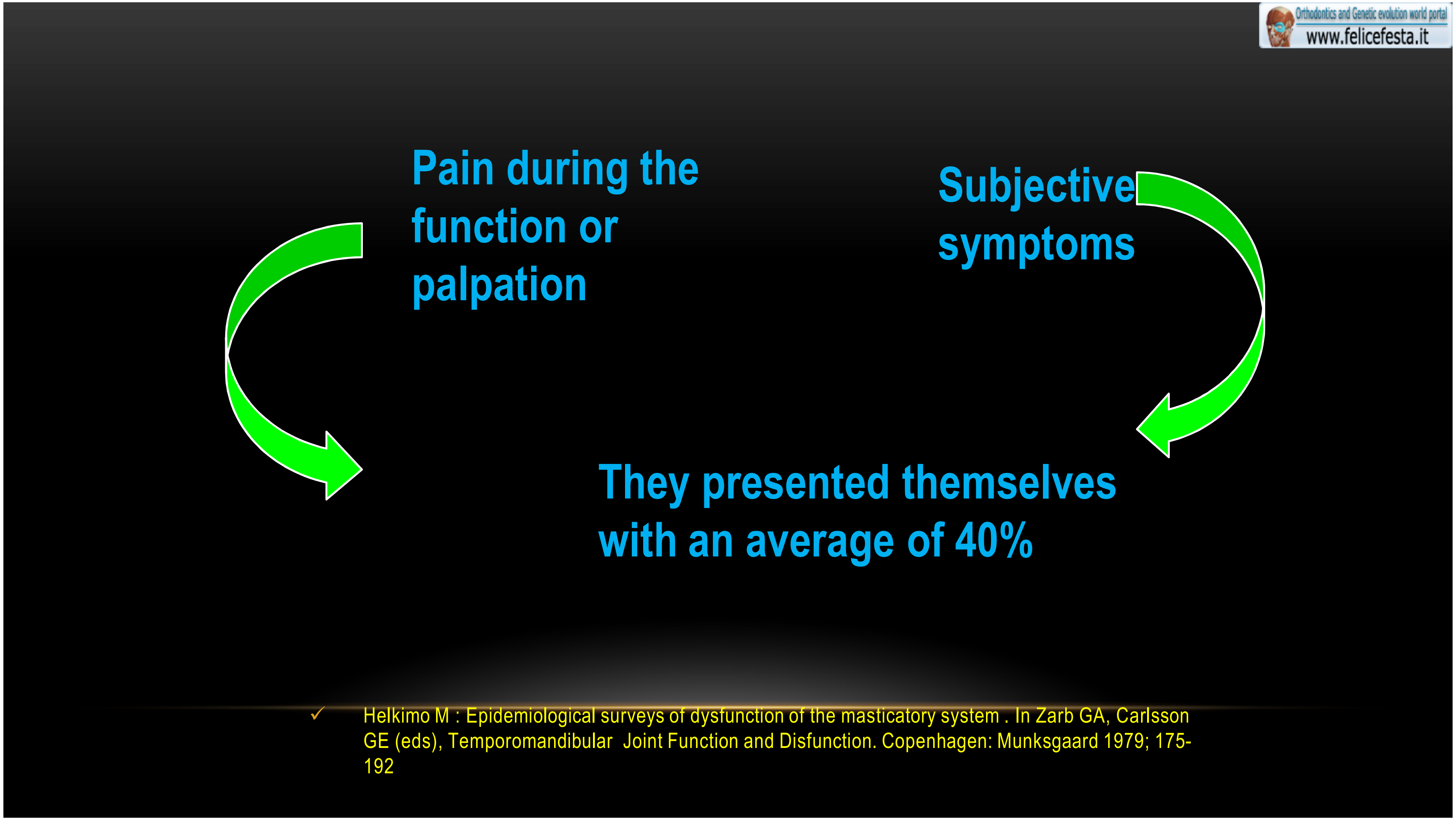
- Frankel Function Regulator
- TMD in children

TMD in children

In 1989, two conferences were held concerning the temporomandibular disorders in Children. Dr. Jeffrey Okeson defined the TMDs as all disorders related to the function of the masticatory system.

The intention was to highlight that the TMDs are found in children and adolescents, as much as in adults.

- ✓ Okeson JP:Temporomandibular disorders in children.Pediatric Dent 1989;11:325-329
- ✓ American Academy of Pediatric Dentistry:Treatment of temporomandibular disorders in children:Summary statements and recommendations.JADA 1990;120:265-269
- ✓ President's Conference on the Examination,Diagnosis and Management of Temporomandibular Disorders. JADA 1983;106:75
- ✓ Padamsee M . et al.: Functional disorders of the stomatognathic system Part II .J Pedodont 1985;10:1-21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Pain during the function or palpation
Subjective symptoms
They presented themselves with an average of 40%
Helkimo M : Epidemiological surveys of dysfunction of the masticatory system . In Zarb GA, Carlsson GE (eds), Temporomandibular Joint Function and Disfunction. Copenhagen: Munksgaard 1979; 175-192

TMD in children

There is objective presence of signs and symptoms in about 40% of children and adolescents.

Of these, only 5% requires a treatment.

✓ Bureau of the Census: Current Population Reports: Projections of the Population of States by Age, Sex, Race: 1988 to 2010. Series P-25 ,No. 1017. Washington, D. C.: Government Printing O ffice, 1988

What factors are associated with TMDs?

The factors of the TMJ dysfunction in children and adolescents as well as adults are considered multifactorial, in this aetiology these factors can be found :

- Eating habits
- Trauma
- Malocclusions
- Neuromuscular disorders
- Particular emotional states

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The potential confusions in determining the characteristics of craniomandibular disorders shows that:

The TMJ disorders are not a single disorder, but rather the classification of a number of diseases that can affect different tissues within the TMJ and structures associated with it.

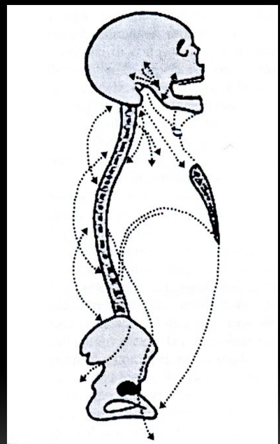
In the large classification of disorders there is no consensus about what is the best diagnostic approach. This often leads to disagreements about the aetiology and what are the affected tissues.

The TMDs must be understood in the context of growth and adaptive responses of cells and tissues that make up the TMJ and the masticatory system.

- Orthodontic treatment can not be a form of prevention but rather alleviate withdrawal symptoms once they occur.
- An important question is the possibility that orthodontic treatment will lead to a greater incidence of temporomandibular disorders.
- The literature provides support to the theory that in general orthodontic treatment during adolescence does not increase or decrease the risk of developing the temporomandibular disorders later in life.

- Sadowsky C. The risk of orthodontic treatment for producing temporomandibular disorders: a literature review. Am J Orthod Dentofac Orthop 1992; 101: 79-83.

General neuromuscular disorders can affect the neck area and shoulders, as well as more distant districts.

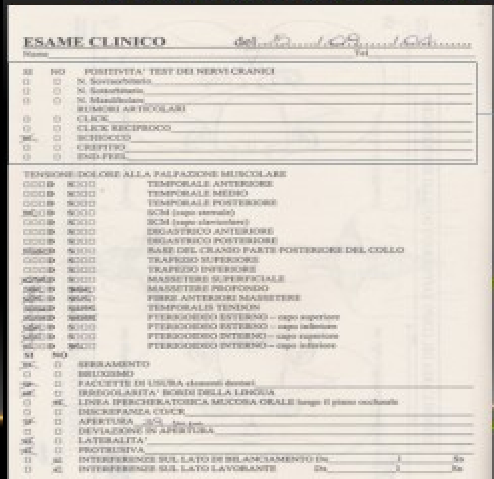


The prognostic value of the signs and symptoms.

To prevent or treat temporomandibular dysfunction a splint therapy in combination with spine exercises can be implemented

TMJ CLINICAL DIAGNOSIS: INTRAARTICULAR

EXTRAARTICULAR



TMJ CLICKING 20%

LOCKING

the splint therapy. These splints force the mandible to an anterior position for 24 hours a day. This therapy is associated to physical therapy, spray and stretch technique and biofeedback. Once the symptoms are reduced the clinician can go on to the second step.

Phisical therapy. Tongue exercises+ spine exercises . 6 months

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Thank You

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