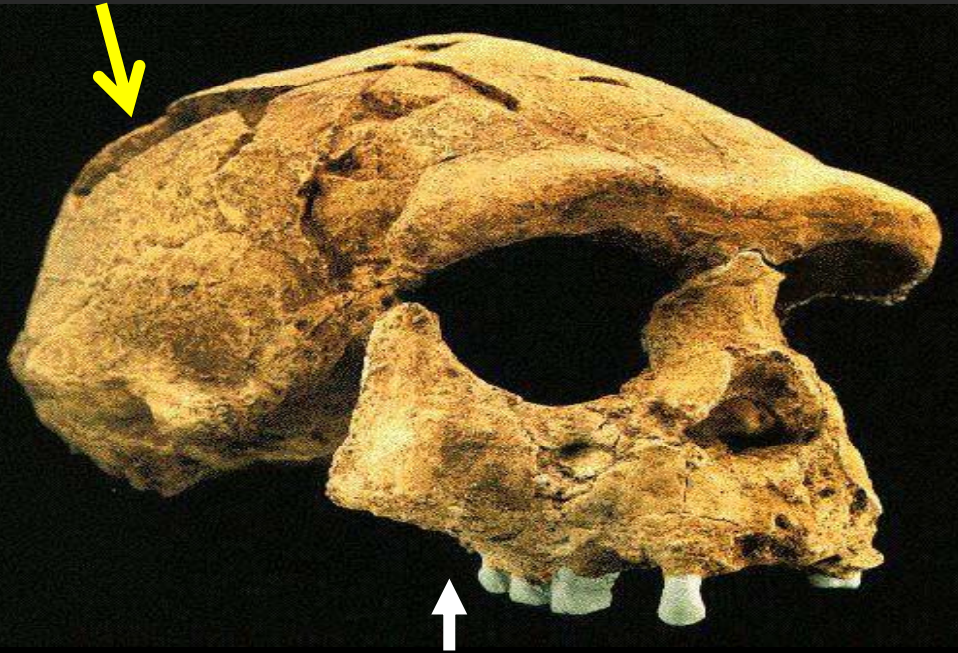


- **Terapia ortodontica 3D dell'ATM**
- **Terapia ortodontica 3D pre-chirurgica**
- **Terapia ortodontica dei casi complessi 3D**
- 



## Asiatic Homo Erectus



**IN ASIA Hominids had a flatter and larger maxilla related to Caucasians**

## Caucasic Homo Erectus

Sangiran 17, "Pithecanthropus VIII", *Homo erectus*

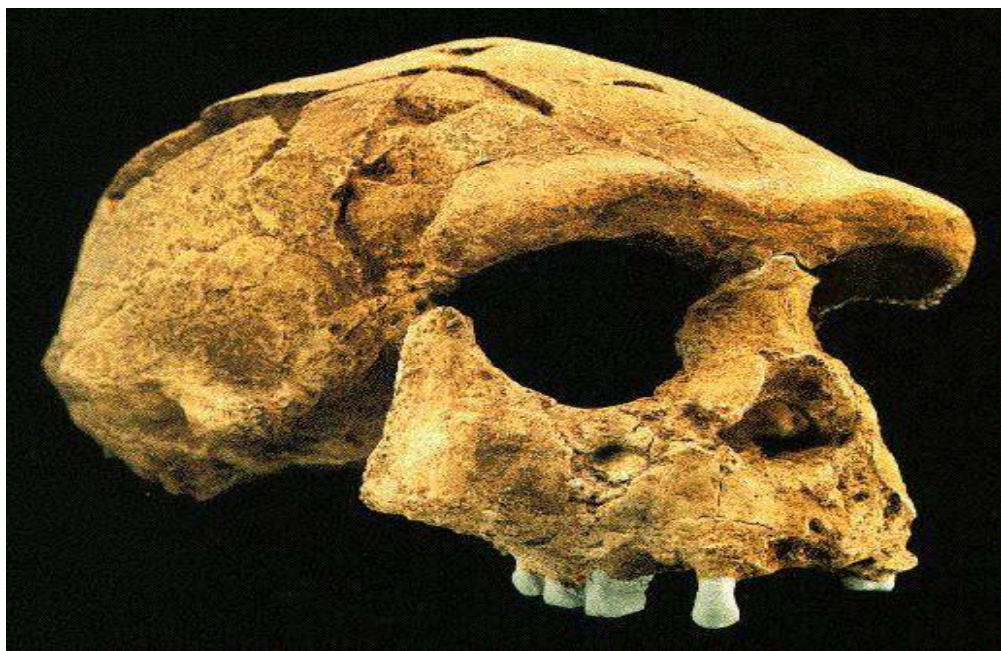
Discovered by Sastroamidjojo Sartono in 1969 at Sangiran on Java. This consists of a fairly complete cranium, with a brain size of about 1000 cc. It is the most complete *erectus* fossil from Java. This skull is very robust, with a slightly projecting face and huge flaring



# ...ANCHE SE GLI OMINIDI DIFFERISCONO TRA LE VARIE AREE

Sangiran 17, "Pithecanthropus VIII", *Homo erectus*

Discovered by Sastrohamidjojo Sartono in 1969 at Sangiran on Java. This consists of a fairly complete cranium, with a brain size of about 1000 cc. It is the most complete *erectus* fossil from Java. This skull is very robust, with a slightly projecting face and huge flaring



**ASIAN HOMINIDS HAD A  
FLATTER AND LARGER  
MAXILLA**



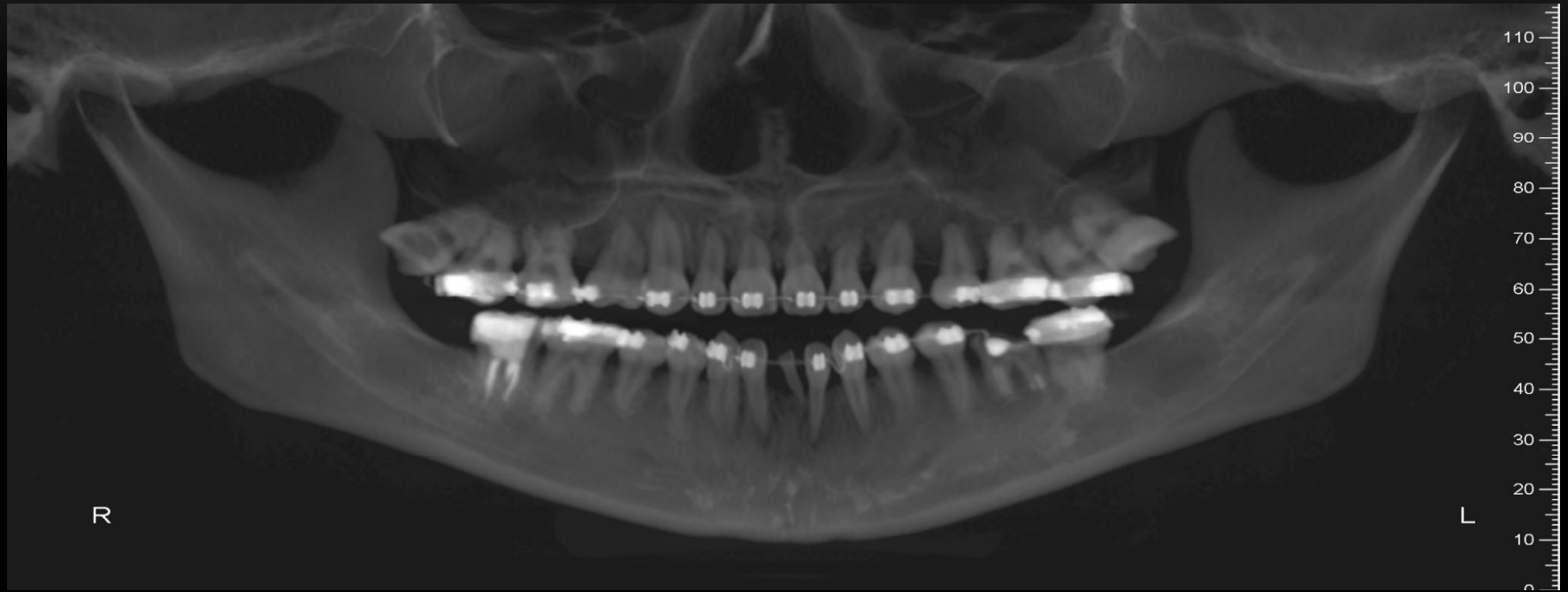


Case 28 TMJ Intratrarticular: Asiatic Class III, severe Asymmetrical long mandible, Mild Dolicofacial, presurgical orthodontics 9 months + Straight wire+ + Orthognatic Surgery

Age:26 years presurgical ortho. + 12 Months straight-wire 12 Months retention  
Passive Aligners+ Tongue /spine exercises

**TMJ: Severe occipital pain, Retrofaringeal Muscles, Lower Trapezius**





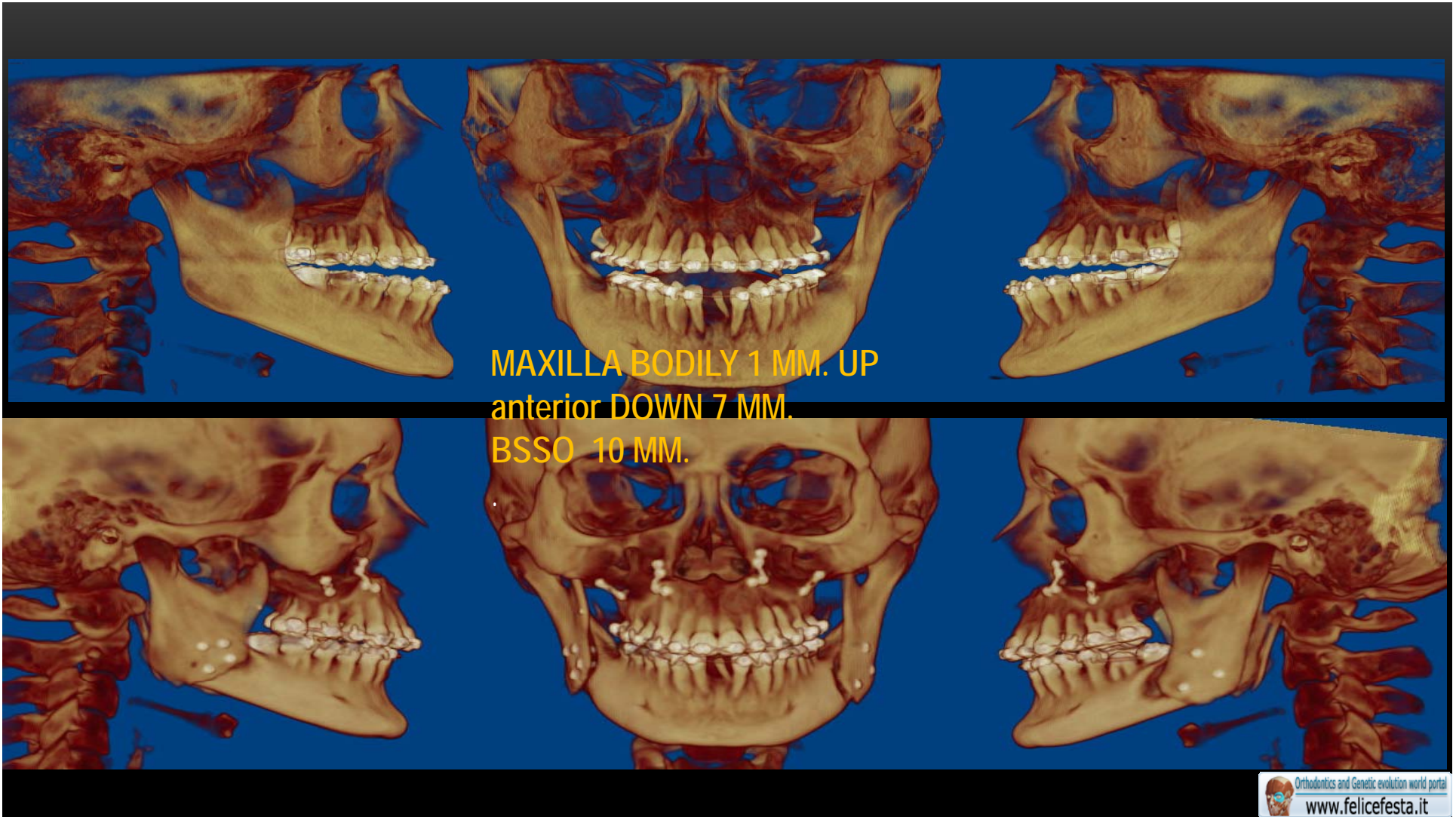


Lateral, Orthogonal, Built-in Mag = 0%



100 mm

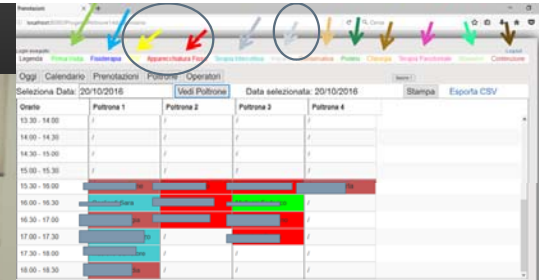
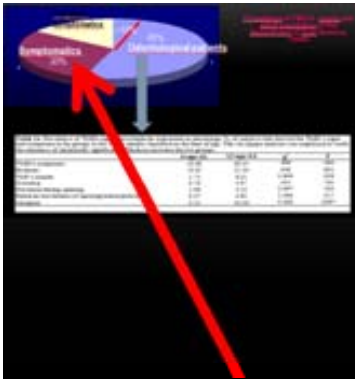




MAXILLA BODILY 1 MM. UP  
anterior DOWN 7 MM.  
BSSO 10 MM.

- **Terapia ortodontica 3D dell'ATM**
- **Terapia ortodontica 3D pre-chirurgica**
- **Terapia ortodontica dei casi complessi 3D**
- 

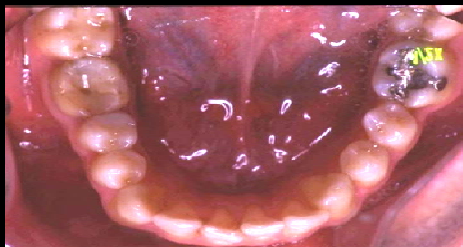
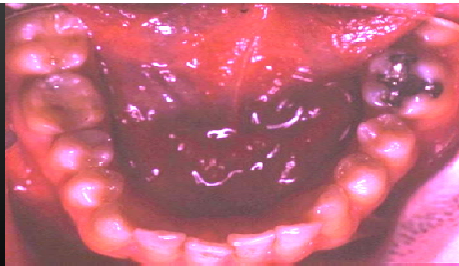




Case 14 TMJ Extrarticular: Class I max contract left, self ligating low friction, postextractive implant on 26

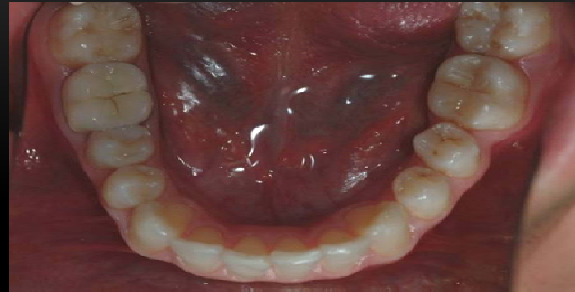
Age: 32 years Passive Aligners 2 Months, 18 Months Self Ligating Low Friction, Composite 21 Crown, 12 Months Passive Aligners Retention

Upper left maxilla  
contraction, cross-  
bite 21,24,25,26,27  
Mild lower anterior  
crowding



Extraction of upper left  
first molar (26)  
and placement of a  
postextractive implant





Implantology performed from Dr. V. Pedrazzoli

---

- Terapia ortodontica 3D dell'ATM
- Terapia ortodontica 3D pre-chirurgica
- **Terapia ortodontica dei casi complessi 3D**
- 

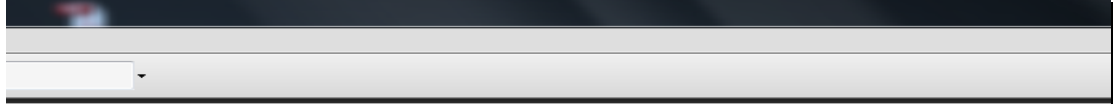


Submissions with an Editorial Office Decision for Author Felice Festa, Ph.D., M.D.

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

Action	Manuscript Number	Title	Initial Date Submitted	Status Date	Current Status	Date Final Disposition Set	Final Disposition
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<a href="#">Action Links</a>	SCS-11-45	Orbital volume and surface after Le Fort III advancement in syndromic craniosynostosis Short Title: Orbital volume volume and Le Fort III	Dec 17, 2010	Jan 31, 2012	Completed	Jan 31, 2012	Accept

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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--

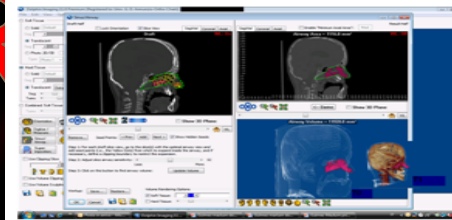
Manuscript Number:	SCS-11-45R3
Full Title:	Orbital volume and surface after Le Fort III advancement in syndromic craniosynostosis Short Title: Orbital volume volume and Le Fort III
Short Title:	Orbital volume and le Fort III
Article Type:	Original Article
Keywords:	syndromic synostosis, orbital volume, 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.



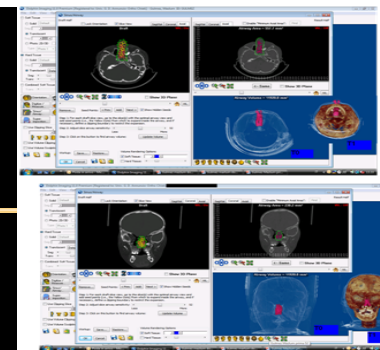
# VOLUMETRIC EVALUATION OF

## 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



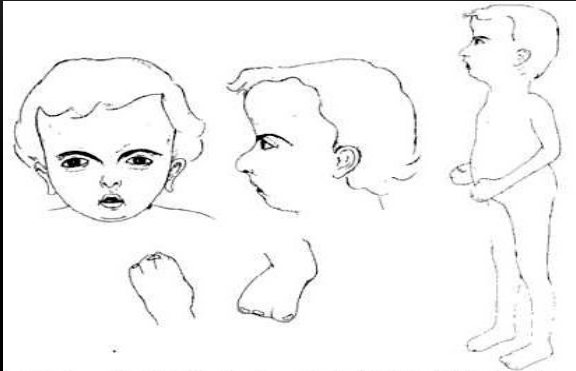
For the inferior limit of the upper airway space, in order to standardize the measurements in all the subjects, the line between the posterior nasal spine and the Basion point was considered (pns-Ba line).



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.

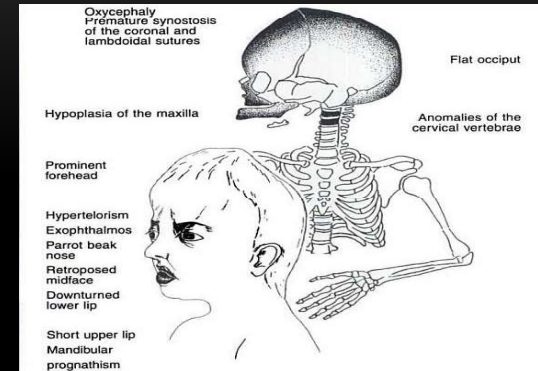


## Apert syndrome



- 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.

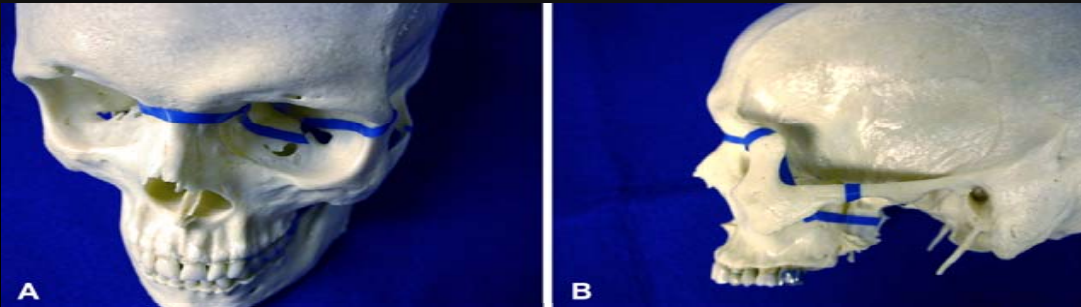
[Raposo-Amaral CE](#)<sup>1</sup>, [Denadai R](#), [Ghizoni E](#), [Buzzo CL](#), [Raposo-Amaral CA](#).

### ⊕ 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. Tanfani 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

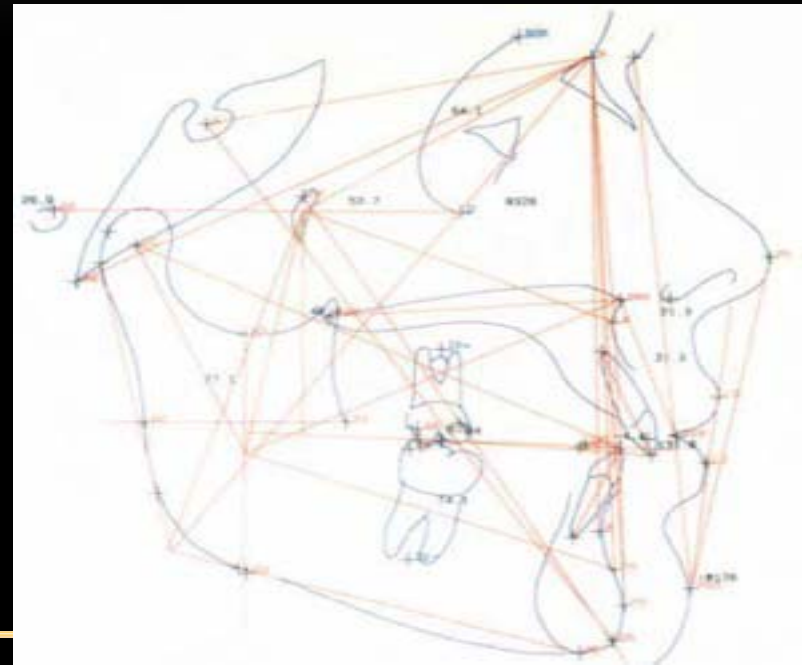
- 12 subjects suffering from Apert and Crouzon syndrome were evaluated in the sample, 6 subjects suffering from Crouzon Syndrome and 6 from Apert Syndrome.
- Age was in a range from 5-9 y. old. In the sample there were 5 females and 7 males



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.

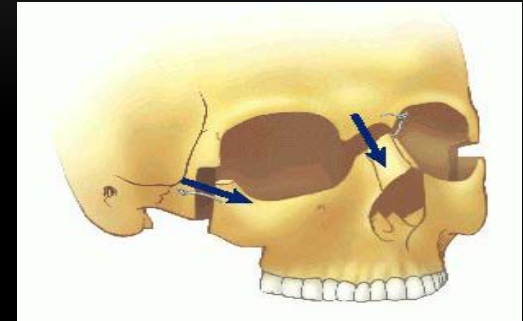
## ALL SUBJECTS INCLUDED SHOWED:

- Frequent episodes of obstructive 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:  $0^{\circ}$  , 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.





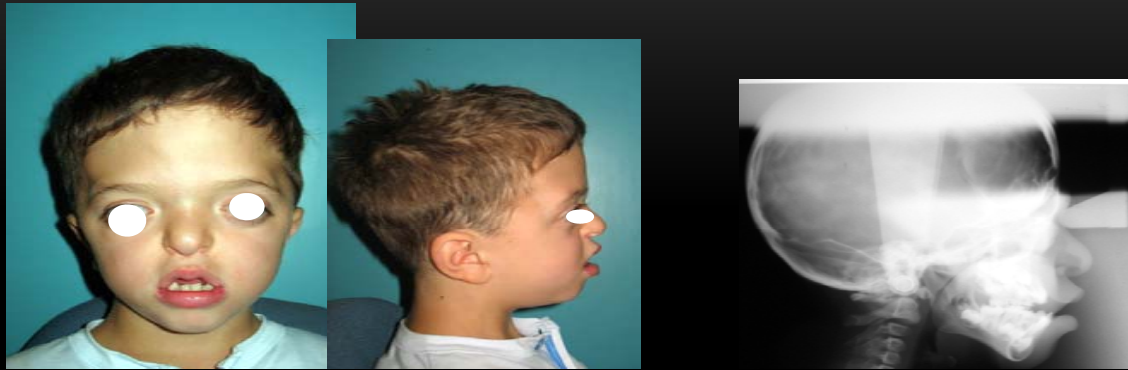
Patient affected by Crouzon syndrome pre-treatment photo



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<sup>3</sup>. In general, the contributions of errors to the total variance were small, from 0.094% for the volume.

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

- inter-observer method error

The mean differences between the first and the second operators were 12.7 mm<sup>3</sup>

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

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

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

Page: 1 of 1 (2 total completed submissions)

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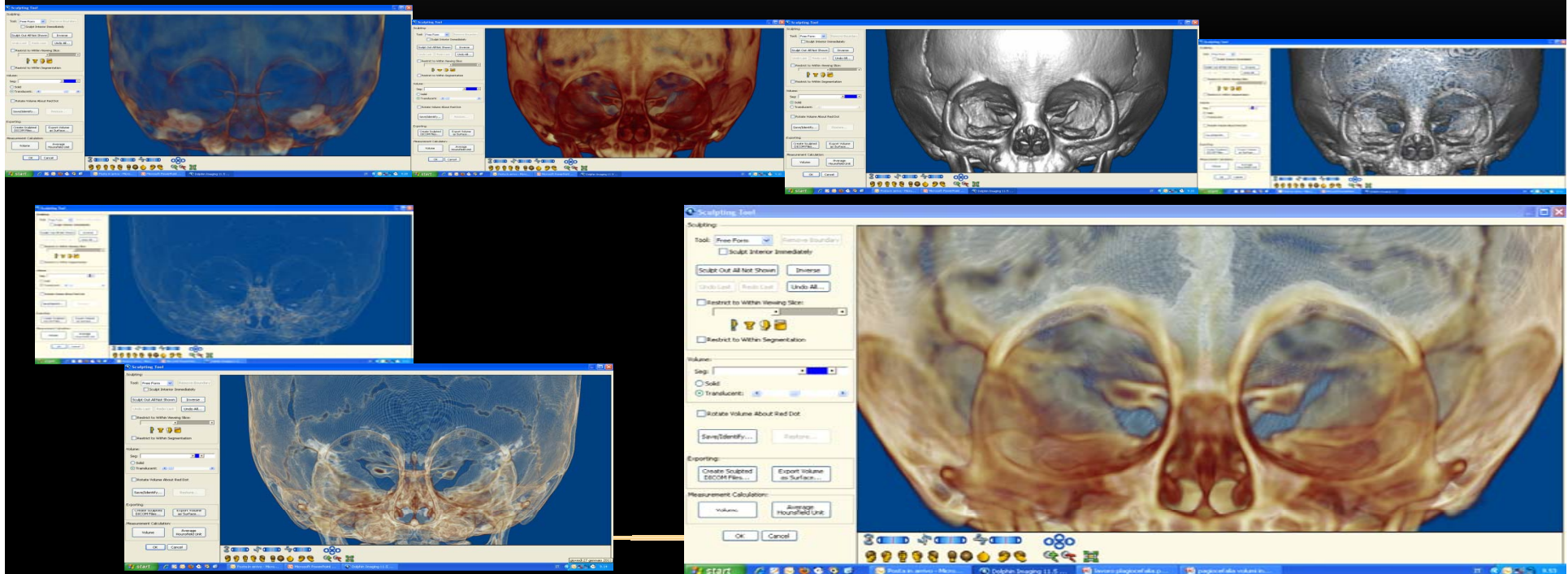
**Journal of Craniofacial Surgery**

**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
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.



# VOLUME ASSESSMENT OF THE ORBIT FROM EXTERNAL SEGMENTATION (A)



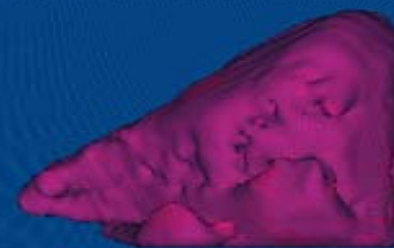
## ALFA SEGMENTATION

Average Hounsfield Unit is 456.67 at 1472 voxel hits.

Volume is 10671.86 mm<sup>3</sup> (10.67 cm<sup>3</sup>) at 173243 voxel

Airway Volume = 10751.7 mm<sup>3</sup>

## BETA SEGMENTATION



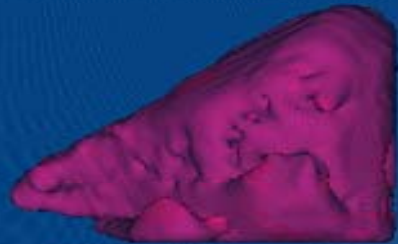
# ALFA SEGMENTATION

Average Hounsfield Unit is 456.67 at 1472 voxel hits.

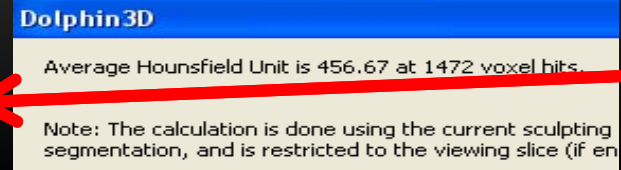
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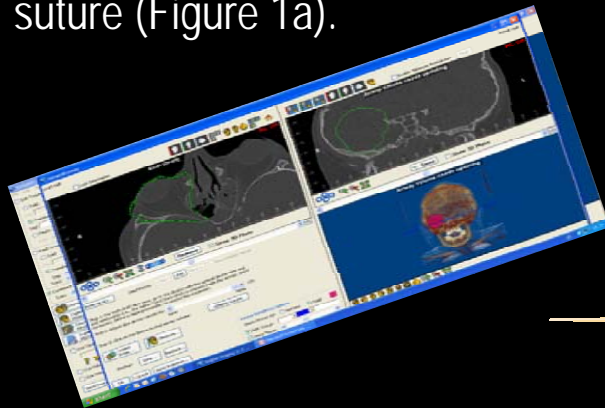
# BETA SEGMENTATION



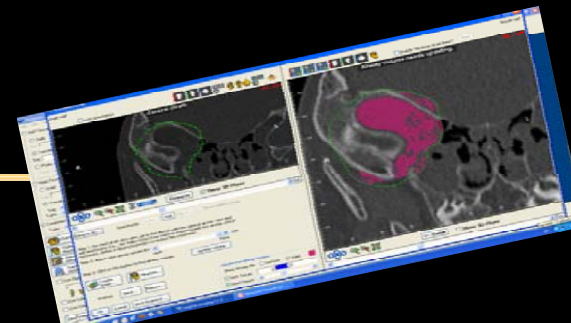
# ALFA SEGMENTATION



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.



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

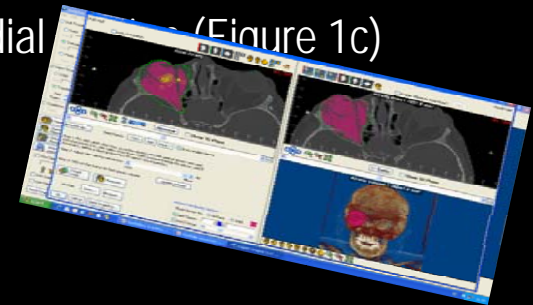




Table 1. Statistical analysis of data

	N	Mean	Std. Deviation	Range	Minimum	Maximum	Std. Error
Right eye surface (T0)	12	862,6	152,4	553,7	623,2	1176,9	25,4
Right eye surface (T1)	12	945,7	178,4	609,6	703	1312,6	29,7
Left eye surface (T0)	12	885,3	199,3	604	639,8	1243,8	33,2
Left eye surface (T1)	12	977,1	225,5	654,4	668,1	1312,5	37
Right eye volume (T0)	12	22267	4925,3	11669,2	17701,1	29370,3	820,8
Right eye volume (T1)	12	26511	5973	15555,8	20985,2	32654,1	905,5
Left eye volume (T0)	12	22706,3	5980,6	12793,1	17243,5	30036,6	906,7
Left eye volume (T1)	12	26256,4	6806,3	18279,7	19470,8	37750,5	1134,3
<b>WILCOXON SIGNED RANK TEST</b>							
	N	W	P				
Right eye surface (T0/T1)	12	416	<0,001				
Left eye surface (T0/T1)	12	552	<0,001				
Right eye volume (T0/T1)	12	666	<0,001				
Left eye volume (T0/T1)	12	666	<0,001				

The increase of the orbital volume after Le Fort III advancement was statistically significant for both right and left eyes ( $P < 0,001$ ), as well as a statistically significant variation of the surface of the right and left eyes was observed ( $P < 0,001$ ).

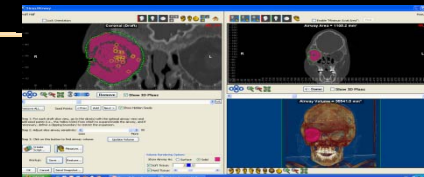
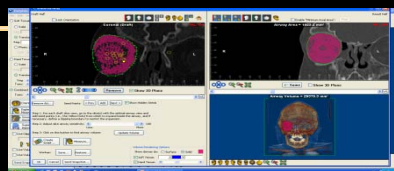
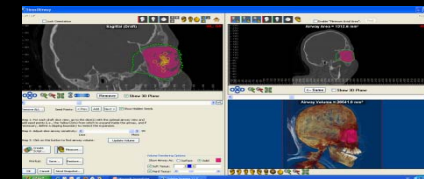
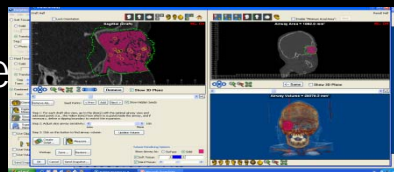
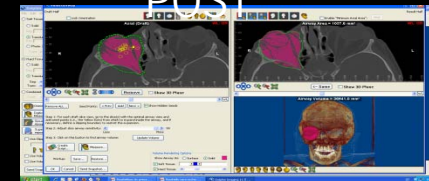
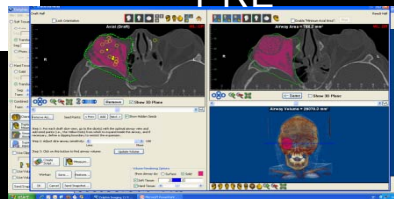
PRE  
Right orbit segmentation

POST

Axial plane

Sagittal plane

Coronal plane



**THANK YOU FOR THE ATTENTION**



**SIDO 2016**

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