Surgical Orthodontics Diagnosis and Treatment Planning

Thomas J. Cangialosi, D.D.S.
Associate Dean Postdoctoral Education
Director Division of Orthodontics
Columbia University

Physical attractiveness

- Beauty – a sign of goodness
- Ugliness – a sign of evil

Features of attractiveness

- Large eyes
- High cheek bones
- Narrow nose

Facial Esthetics

- Physical beauty – How do we discern it?
- Assessment of beauty – visceral attention to small variations.
    1. Size
    2. Symmetry of facial features
    3. Body weight

Ideal Male Face

- Broad forehead
- Prominent nose and cheekbones
- Large jaw and strong chin

Ideal Female Face

- High forehead
- Full lips
- Shorter jaw
- Shorter nose and chin

Facial Analysis

- Full Face – brachycephalic, mesocephalic, dolicocephalic
- Profile – convex, concave, flat

Facial Analysis

- Posture
- Lip Strain
- Lip competence
- Symmetry
- Swallowing
- Tongue posture
- Dental display

Photographic Analysis

- Evaluate:
  - Lip competence
  - Mentalis strain
  - Perioral musculature
  - Profile
  - Facial proportions

Intraoral Examination

- General dental and oral health
  - Hygiene
  - Periodontic
  - Restorative

Vertical – Overbite, openbite

A-P - Anterior crossbite, overjet

Transverse – Posterior crossbites

Model Analyses

- Measurements
  - overbite
  - overjet
  - open bite
  - Bolton analysis
  - Record individual tooth positions
  - Evaluate dental compensation

Panoramic X-ray

- Check for:
  - Unerupted or impacted teeth
  - Generalized periodontal assessment
  - Other dental pathology Root(resorption)
  - Overt signs of TMJ pathology
  - Root form and parallelism

Cephalometric Analysis

- Columbia Analysis
- COGS Analysis
- Grummons A-P Analysis

Columbia Analysis

	Children Mean	Children SD	Adults Mean	Adults SD
SNA	80.8	3.9	82.0	3.9
SNB	78.0	3.1	80.0	3.6
ANB	2.8		2.0	
Sn-GoGn	32.3	4.7	31.7	5.2
Y-axis	67.0		67.0	
Holdaway angle	2.0		2.0	
L1-GoGn	92.8	6.1	91.9	7.6
L-SN	103.5	5.0	104.0	5.8
Angle I/I	130.4	7.3	131.0	9.2
PP-GoGn	22.0		22.0	5.6
L1-APo	0 mm (range from -1 to +3)			
L1-NB	4 mm			
NB-Po	„not established			
Ratio L1-NB/NB-Po	1:1			
Ratio S-Go/N-Me	0.65			
Ratio N-ANS/ANS-me	0.80			
Extension Go-Gn	+, 0, -			
Bolton Index	0.77			

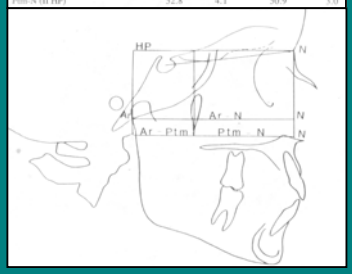
Columbia Analysis

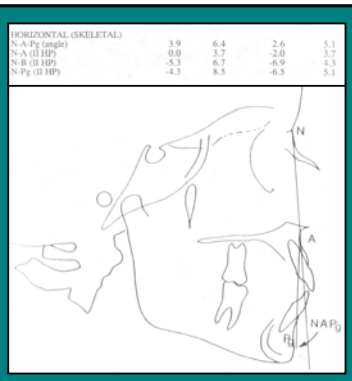
Columbia Analysis

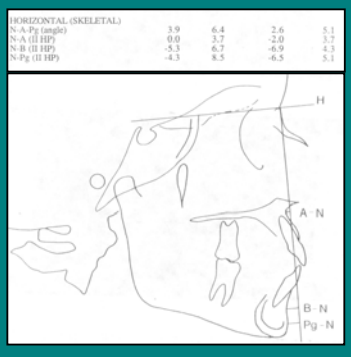
	Child Mean	Child S.D.	Adult Mean	Adult S.D.
Skeletal				
SNA	80.8	3.9	82.3	3.9
SNB	78.0	3.1	80.0	3.6
ANB	2.8		2.0	
SN-GoGn	32.3	4.7	31.7	5.2
Y Axis	67.0		67.0	
Ratio PFH/AFH			0. 65	
Ratio UFH/LFH			0. 80	
Extension GoGn			+or- 0	
PP-GoGn	22.0		22.0	
SN-PP	8.0		8.0	
Dental				
U1-SN	103.5	5.0	104.0	5.8
L1- GoGn	92.8	6.1	91.9	
L1-APo	0 (+1-3mm.)			
L1-NB			4 mm.	5.6
Po-NB	Not established			
Ratio L1-NB/Po-NB	1:1			

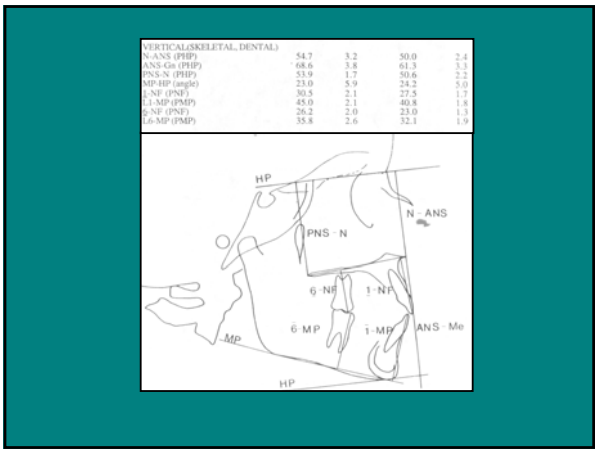
COGS Analysis

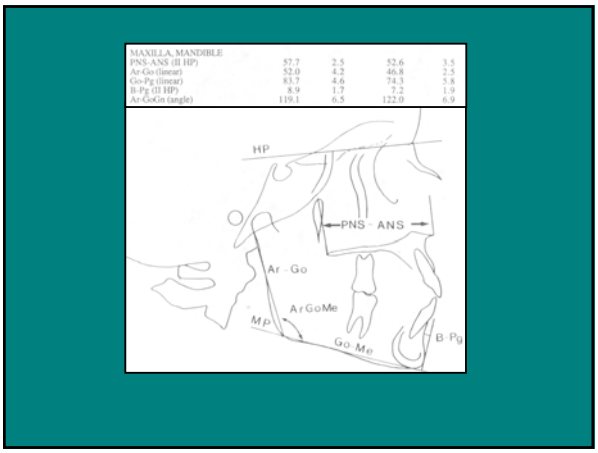
Measurement	Standard male	SD	Standard female	SD
CRANIAL BASE				
AR-Ptm (II HP)	37.1	2.8	32.8	1.9
Ptm-N (II HP)	52.8	4.1	50.9	3.0

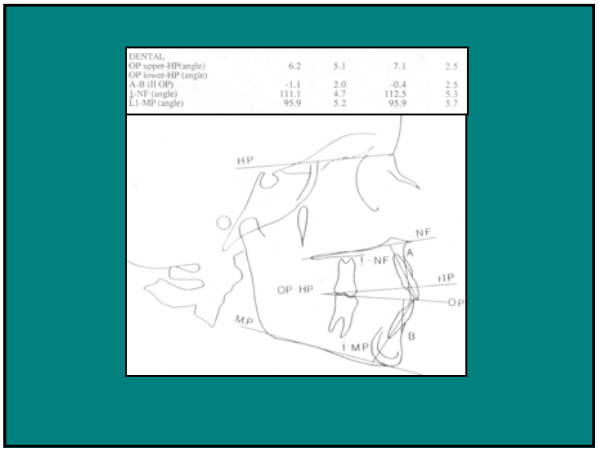












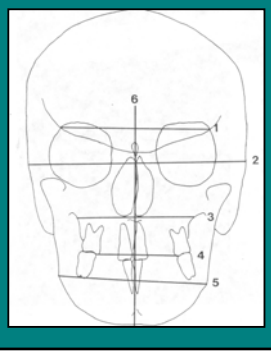
Grummons Analysis

A simpler method for determining asymetry uses a grid to compare locations of bilateral landmarks. The midsagittal line is placed along a vertical from crista galli through the nasal septum. Location of the major landmarks in relation to the midline and to horizontal grid lines are noted. A grid drawn on acetate with demarcations of one centimeter is useful for this purpose.

After tracing the PA cephalogram, construct horizontal planes by joining the following bilateral landmarks (see Figure 34):

1. The intersection of the lateral wall of the orbit with the greater wing of the sphenoid (the oblique line)
2. The most lateral point on the zygomatic arch
3. The deepest point on the concavity formed by the lateral wall of the maxilla and the inferior border of the zygomatic process of the maxilla
4. Occlusal plane (upper first molar cusps)
5. Gonion.

A-P Analysis (Grummons)



Questions

- 1. Is this a face that needs change?
- 2. Does the Patient perceive the need?
- 3. Is there a reasonable possibly of producing a functional, esthetic and stable result by orthodontics alone?
- 4. Is there any pathological condition which may dictate a surgical approach?

Presurgical Orthodontic Goals

- 1. Level align the dental arches.
- 2. Coordinate the dental arches.
- 3. Remove dental compensations.
- 4. Stabilize the dental arches.
- 5. Provide attachments for intermaxillary fixation.

Postsurgical Orthodontic Goals

- 1. Close any residual space.
- 2. Improve occlusal interdigitation.
- 3. Finishing and artistic positioning.
- 4. Smooth transition to retention.
- 5. Exercises to improve range of motion.

Class III Compensation

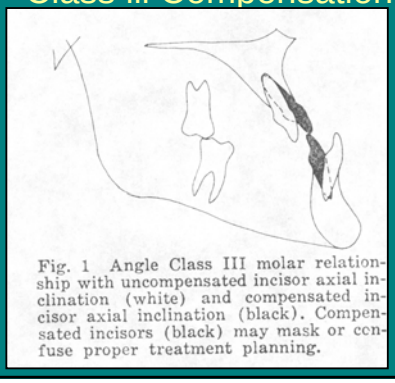


Fig. 1 Angle Class III molar relationship with uncompensated incisor axial inclination (white) and compensated incisor axial inclination (black). Compensated incisors (black) may mask or confuse proper treatment planning.

Class II Division 1 Compensation

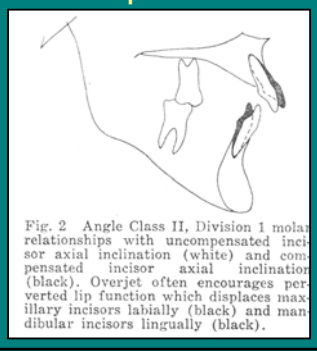


Fig. 2 Angle Class II, Division 1 molar relationships with uncompensated incisor axial inclination (white) and compensated incisor axial inclination (black). Overjet often encourages perverted lip function which displaces maxillary incisors labially (black) and mandibular incisors lingually (black).

Class II Division 2 Compensation

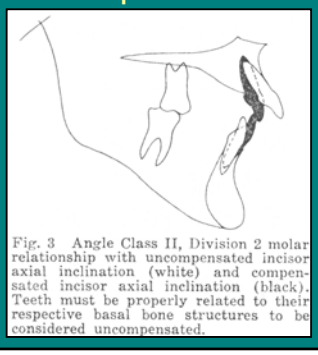


Fig. 3 Angle Class II, Division 2 molar relationship with uncompensated incisor axial inclination (white) and compensated incisor axial inclination (black). Teeth must be properly related to their respective basal bone structures to be considered uncompensated.

Open Bite Compensation

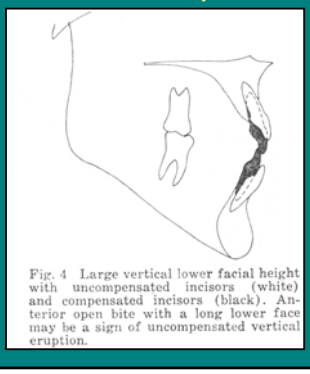


Fig. 4 Large vertical lower facial height with uncompensated incisors (white) and compensated incisors (black). Anterior open bite with a long lower face may be a sign of uncompensated vertical eruption.

Deep Bite Compensation

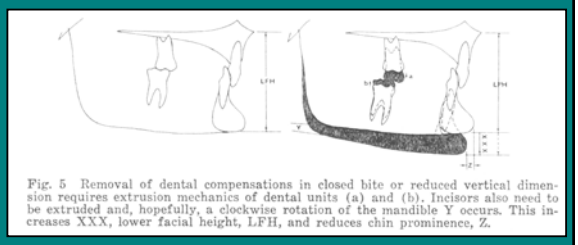
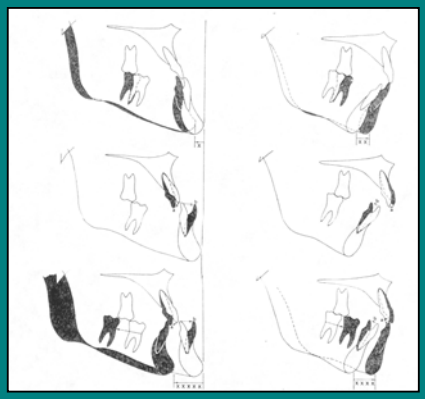
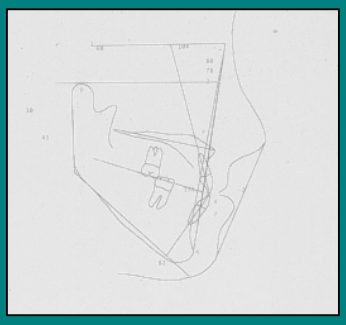


Fig. 5 Removal of dental compensations in closed bite or reduced vertical dimension requires extrusion mechanics of dental units (a) and (b). Incisors also need to be extruded and, hopefully, a clockwise rotation of the mandible Y occurs. This increases XXX, lower facial height, LFH, and reduces chin prominence, Z.



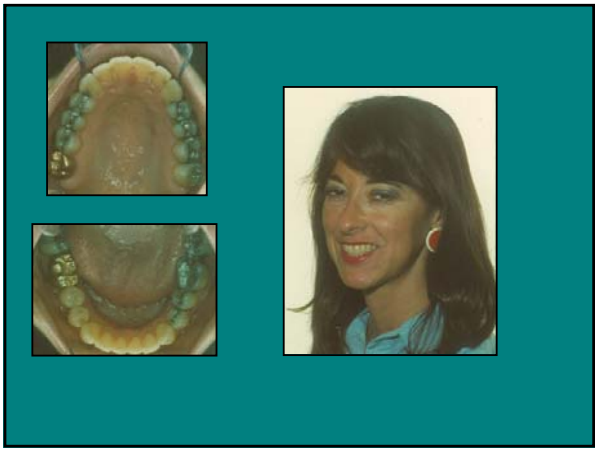
Patient B.S. 29 yrs. 4 mos.

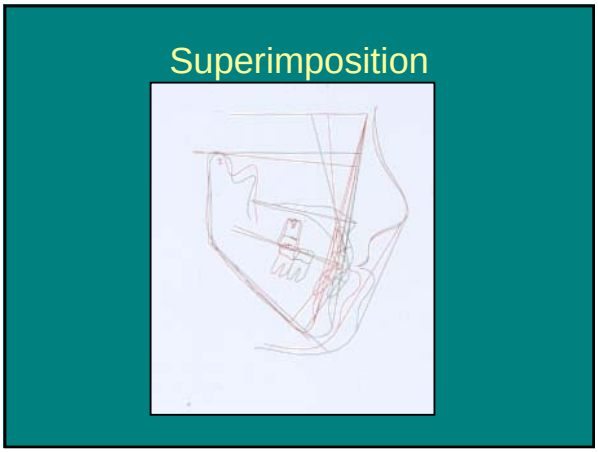
Initial Ceph



Postsurgery Ceph


Three years Post Treatment

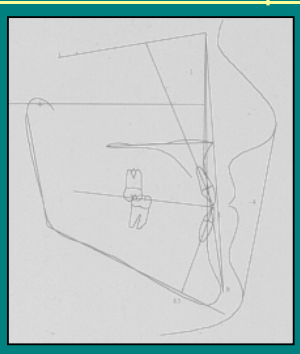


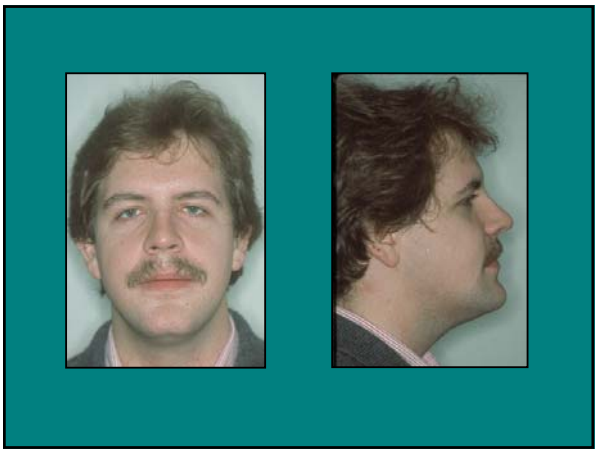

Superimposition


Pre
post

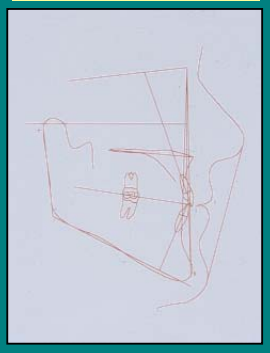
Patient B.N. 19 yrs. 7 mos.


Pretreatment Ceph

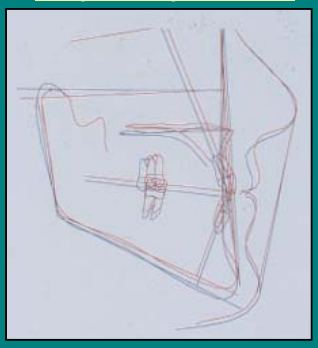




Post Treatment



Superimposition



Pre Post