



**CHANGES RESULTING FROM BEGG ORTHODONTIC
TREATMENT WITH EMPHASIS ON THE SOFT TISSUE PROFILE**

VOLUME 2
APPENDICES

A report submitted in partial fulfilment for
the degree of Master of Dental Surgery.

by

STEVEN FARRER, B.D.S.

Department of Dentistry,
Faculty of Dentistry,
The University of Adelaide,
South Australia.

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SECTION 1

LITERATURE SUMMARIES AND METHOD.



APPENDIX 1

RATIOS REPORTED IN THE LITERATURE FOR HARD TISSUE : SOFT TISSUE
RETRACTIONS

AUTHOR	U1 : UL	U1 : LL	L1 : LL	OTHER
KING 1960	1 : 0.5			
RUDEE 1964	2.93 : 1	1 : 1		
GARNER 1974	2 : 1 (females) 3.6 : 1 (males)		1 : 1 (females)	
WISTH 1974	2 : 1 (small OJ group) 3 : 1 (large OJ group)			
ROOS 1977	2.5 : 1		1 : 0.9	A : SLS = 1 : 1.4 B : ILS = 1.2 : 1
LA MASTRA 1981				A : SLS = 1.4 : 1 B : ILS = 1.09 : 1
LO and HUNTER 1982	2.5 : 1			
WALDMAN 1982	3.8 : 1			

(Most values represent approximate mean ratios)

UL = upper lip

LL = lower lip

U1 = upper incisor

L1 = lower incisor

OJ = overjet

A = A point

B = B point

SLS = superior labial sulcus

ILS = inferior labial sulcus

CORRELATION COEFFICIENTS (r VALUES) REPORTED IN THE LITERATURE

AUTHOR	CHANGES RELATED TO U1	CHANGES RELATED TO L1	OTHER
WYLIE 1955	ST convexity - U1 = 0.44	ST convexity - ANG L1 = 0.01 ST convexity - L1 = 0.17	
STONER et al. 1956		ANG L1 - LL = -0.375	
BLOOM 1961	U1 - SLS = 0.89 U1 - UL = 0.87 U1 - LL = 0.82 U1 - SLS to U1 = 0.89 U1 - UL to LL = 0.73	L1 - ILS = 0.87 L1 - LL = 0.93 L1 - ILS to LL = 0.87	Change of overbite - UL to LL = 0.82 Change of overjet - UL to LL = 0.91
RUDEE 1964	U1 - UL = 0.73 U1 - LL = 0.49	L1 - LL = 0.70	
HASSTEDT 1956 Cited by Rudee 1964	U1 - UL = 0.55	L1 - LL = 0.52	
O'REILLY 1957 Cited by Rudee 1964	U1 - UL = 0.61 U1 - LL = 0.48	L1 - LL = 0.56	
HERSHEY 1972	U1 - UL = 0.79 U1 - SLS = 0.66 U1 - LL = 0.48 U1 - ILS = 0.33 All values relating to A point are very small	L1 - UL = 0.62 L1 - LL = 0.52 L1 - ILS = 0.49 L1 - SLS = 0.48 B - ILS = 0.78 B - SLS = 0.47 B - UL = 0.45 B - LL = 0.38	Multiple 'r' values relating movement of the 4 hard tissue points to the 4 ST points : SLS 0.71 UL 0.82 LL 0.58 ILS 0.78
ANDERSON et al. 1973	U1 - UL = 0.68	L1 - LL = 0.33	
DE LAAT 1974 (Combined data for all groups)	U1 - UL = 0.59 U1 - LL = 0.39 Rs - A = 0.69 Rs - SLS = 0.44 A - SLS = 0.53 (All significant at 0.001 level)	L1 - LL = 0.59 Ri - B = 0.47 Ri - ILS = 0.44 B - ILS = 0.53 (All significant at 0.001 level)	

UL = upper lip
LL = lower lip
U1 = upper incisor
L1 = lower incisor

SLS = superior labial sulcus
ILS = inferior labial sulcus

ANG = angular change
All changes otherwise linear
Rs = root apex \perp
Ri = root apex $\bar{\perp}$
M = male
F = female

ST = soft tissue
A = A point
B = B point

AUTHOR	CHANGES RELATED TO U1	CHANGES RELATED TO L1	OTHER
HUGGINS and McBRIDE 1975			UL -Interincisal angle = -0.36 (M, class 1 base) -0.22 (M, class 2 base) -0.67 (F, class 1 base) -0.02 (F, class 2 base) LL -Interincisal angle = -0.12 (M, class 1 base) -0.00 (M, class 2 base) -0.90 (F, class 1 base) -0.63 (F, class 2 base)
ROOS 1977	U1 - UL = 0.42 U1 - LL = 0.33 A - SLS = 0.58	L1 - LL = 0.82 B - ILS = 0.69	
JACOBS 1978	H and V change of U1 to : closure of interlabial gap = 0.94 V movement of UL = 0.70 V movement of LL = 0.82		
CANGIALOSI and MEISTRELL 1982 (Begg stage 3 only)	U1 - UL = 0.17 U1 - SLS = 0.07 A - SLS = 0.27		
LO and HUNTER 1982	Nasolabial angle - U1 = 0.77 U1 - UL = 0.77 U1 - SLS = 0.44 U1 - LL thickness = 0.77 U1 - LL = -0.12 U1 - ILS = 0.48		
OLIVER 1982	Total : U1 - UL = 0.61 (M) U1 - UL = 0.51 (F) (Both significant) High lip strain : U1 - UL = 0.92 (M) U1 - UL = 0.85 (F) (Both significant) Low lip strain : U1 - UL = 0.48 (M) U1 - UL = 0.67 (F) (Both insignificant)		Total hard tissue - ST values in relation to U1 retraction : Total : 0.83 (M) 0.85 (F) Thin lips : 0.93 (M) 0.98 (F) Thick lips : 0.73 (M) 0.28 (F)

UL = upper lip

LL = lower lip

U1 = upper incisor

L1 = lower incisor

SLS = superior labial sulcus

ILS = inferior labial sulcus

ANG = angular change

All changes otherwise linear

Rs = root apex 1

Ri = root apex 1

M = male

F = female

ST = soft tissue

A = A point

B = B point

AUTHOR / SUBJECT	SAMPLE SIZE	AGE AT START	LIP POSITION	APPLIANCE	REFERENCE PLANE	SUPERIMPOSITION	METHOD OF MEASUREMENT	TYPE OF MEASUREMENTS	STUDY OF ERRORS
WYLIE 1955 ST	29	X	X	E	nil	N	H	A profile changes / L incisor changes	N
STONER et al. 1956 ST	57 39 extraction 18 non-ext.	X treatment time = 13 m	X	E	pretreatment N-P plane	1. on S-Na at Na 2. mandible	H	L A	N
KING 1960 UL	103 C2	various	X	E HG	perpendicular to FH, through N	N	H	L A	N
BLOOM 1961 ST	60 30 = M 30 = F extraction + non-ext.	early A	"natural position"	E	palatal	palatal plane and structures	H	L	N
RUDEE 1964 ST	85 35 M 55 F	various treatment time = 32 m	"in repose"	E or HG	pretreatment N-P plane	on S-Na at Na	H	L	N
HERSHEY 1972 Lips	36 F 20 C1 15 C2 32 extraction	post - A treatment time = 26.6 m	"relaxed habitual pose"	E	pretreatment N-P plane	on S-Na at Na	H	L	Y

ST = soft tissue
response
UL = upper lip
response

M = male
F = female
C1 = class 1
C2 = class 11,
division 1

X = not specified
A = adolescence
m = months
y = years

X = not specified

B = Begg
E = edgewise
F = function-
al
X = not
specified
HG = head-
gear

N = nasion
P = pogonion
FH = Frankfort
horizontal
S = sella

S = sella
Na = nasion
N = no

H = hand
D = digitizer

L = linear
A = angular

Y = yes
N = no

AUTHOR / SUBJECT	SAMPLE SIZE	AGE AT START	LIP POSITION	APPLIANCE	REFERENCE PLANE	SUPERIMPOSITION	METHOD OF MEASUREMENT	TYPE OF MEASUREMENTS	STUDY OF ERRORS
ANDERSON et al. 1973 ST	70 27 M 43 F	X + 10 y post-retention	X	E	N-P	palatal structures	D	L	Y
ANGELLE 1973 ST	36 21 M 15 F 13 extraction	early - A	X	E	palatal	Na	H	L A	N
DE LAAT 1974 ST	150 50 in each treatment group 20 C1 (9 M + 11 F) 30 C2 (11M + 19 F)	X	various - not standardized	B E (Tweed) E (Riedel)	N-P	N	D	L A	Y
GARNER 1974 Lips	16 6 M 10 F	early - A (Negroe)	X	E	pretreatment N-P plane	at S-Na on Na	H	L	N
WISTH 1974 Lips	60 M small and large overjet groups	early - A	X	X	palatal	maxillary structures	H	L A	N
HUGGINS and McBRIDE 1975 ST	33 C2 14 M 19 F	early - A	X	X	N-P	on Bolton plane and perpendicular to S	H	L A	N

ST = soft tissue response
 UL = upper lip response
 M = male
 F = female
 C1 = class 1
 C2 = class 11, division 1
 X = not specified
 A = adolescence
 m = months
 y = years
 X = not specified
 B = Begg
 E = edgewise
 F = functional
 X = not specified
 N = nasion
 P = pogonion
 FH = Frankfort horizontal
 S = sella
 S = sella
 Na = nasion
 N = no
 H = hand
 D = digitizer
 L = linear
 A = angular
 Y = yes
 N = no

AUTHOR / SUBJECT	SAMPLE SIZE	AGE AT START	LIP POSITION	APPLIANCE	REFERENCE PLANE	SUPERIMPOSITION	METHOD OF MEASUREMENT	TYPE OF MEASUREMENTS	STUDY OF ERRORS
ROOS 1977 ST	30 10 M 20 F	early - A	various	E	perpendicular to S-N at S	N	H	L	N
JACOBS 1978 Lips	20 C2 11 M 9 F extraction of 4 first premolars	early - A	closed, without strain	X	palatal	cranial base planes	H	L (vertical)	N
KOCH et al. 1979 ST	113 5 groups	various	X	E ± F	ST glabella - ST pogonion plane	N	H	L A	N
STROMBONI 1979 ST	33 C2 extraction non-ext.	X	X	F	A point - P	N	H	L A	N
LA MASTRA 1981 Lip sulci	40 C2 18 M 22 F	early - A	X	X	FH	N	H	L A	N
CANGIALOSI and MEISTRELL 1982 UL	18 5 M 13 F	various	X	B (stage 3 only)	N-P	N	H	L A	N

ST = soft tissue
response
UL = upper lip
response

M = male
F = female
C1 = class 1
C2 = class 11,
division 1

X = not specified
A = adolescence
m = months
y = years

X = not specified

B = Begg
E = edgewise
F = function-
al
X = not
specified

N = nasion
P = pogonion
FH = Frankfort
horizontal
S = sella

S = sella
Na = nasion
N = no

H = hand
D = digitizer

L = linear
A = angular

Y = yes
N = no

AUTHOR / SUBJECT	SAMPLE SIZE	AGE AT START	LIP POSITION	APPLIANCE	REFERENCE PLANE	SUPERIMPOSITION	METHOD OF MEASUREMENT	TYPE OF MEASUREMENTS	STUDY OF ERRORS
LO and HUNTER 1982 UL	50 C2 25 M 25 F extraction + non - ext.	early - A	relaxed lip posture	X	FH (anatomic P) + perpendicular through S	N	D	L A	N
OLIVER 1982 UL	40 C2 20 M 20 F	early - A	lightly closed	E	palatal	palate, anterior wall of sella turcica	H	L A	Y
RAINS and NANDA 1982 ST	30 F 21 C2 9 C1 extraction + non - ext.	post - A	relaxed	E	-7° from S-N + perpendicular through S	N	H	L	Y
WALDMAN 1982 UL	41 11 M 30 F	early - A	X	X	PM plane (posterior margin of maxilla)	N	H	L	N
ABDEL KADER 1983	22 M	post - A	X	X	pre - treatment N - P plane	S - N	X	L	N

ST = soft tissue response
 UL = upper lip response
 M = male
 F = female
 C1 = class 1
 C2 = class 11, division 1
 X = not specified
 A = adolescence
 m = months
 y = years
 B = Begg
 E = edgewise
 F = functional
 X = not specified
 N = nasion
 P = pogonion
 FH = Frankfort horizontal
 S = sella
 S = sella
 Na = nasion
 N = no
 H = hand
 D = digitizer
 L = linear
 A = angular
 Y = yes
 N = no

APPENDIX 4

LANDMARKS AND ORDER OF DIGITIZING

(Legend to Figure a)

Order of digitizing	Name of point	Abbreviation
0	sella turcia (axis, (0,0))	S
1	x align	X
2	y align	Y
3	nasion	N
4	soft tissue nasion	NAS
5	pronasale	PN
6	subnasale	SN
7	superior labial sulcus	SLS
8	labrale superius	LS
9	inferior aspect upper lip	IUL
10	superior aspect lower lip	SLL
(9,10)	(stomion)	(STO)*
11	labrale inferius	LI
12	inferior labial sulcus	ILS
13	soft tissue pogonion	POS
14	soft tissue gnathion	GNS
15	gnathion	GN
16	pogonion	P
17	B point	B
18	lower incisor apex	RI
19	infradentale	PRI
20	lower incisor incisal edge	IEI
21	upper incisor incisal edge	IES

22	prosthion	PR
23	upper incisor apex	RS
24	A point	A
25	anterior nasal spine	ANS
26	posterior nasal spine	PNS
27	upper molar mesial contact	MS
28	lower molar mesial contact	MI
29	gonion	GO

* In cases in which the lips were closed the point stomion was digitized twice instead of recording a missing point.

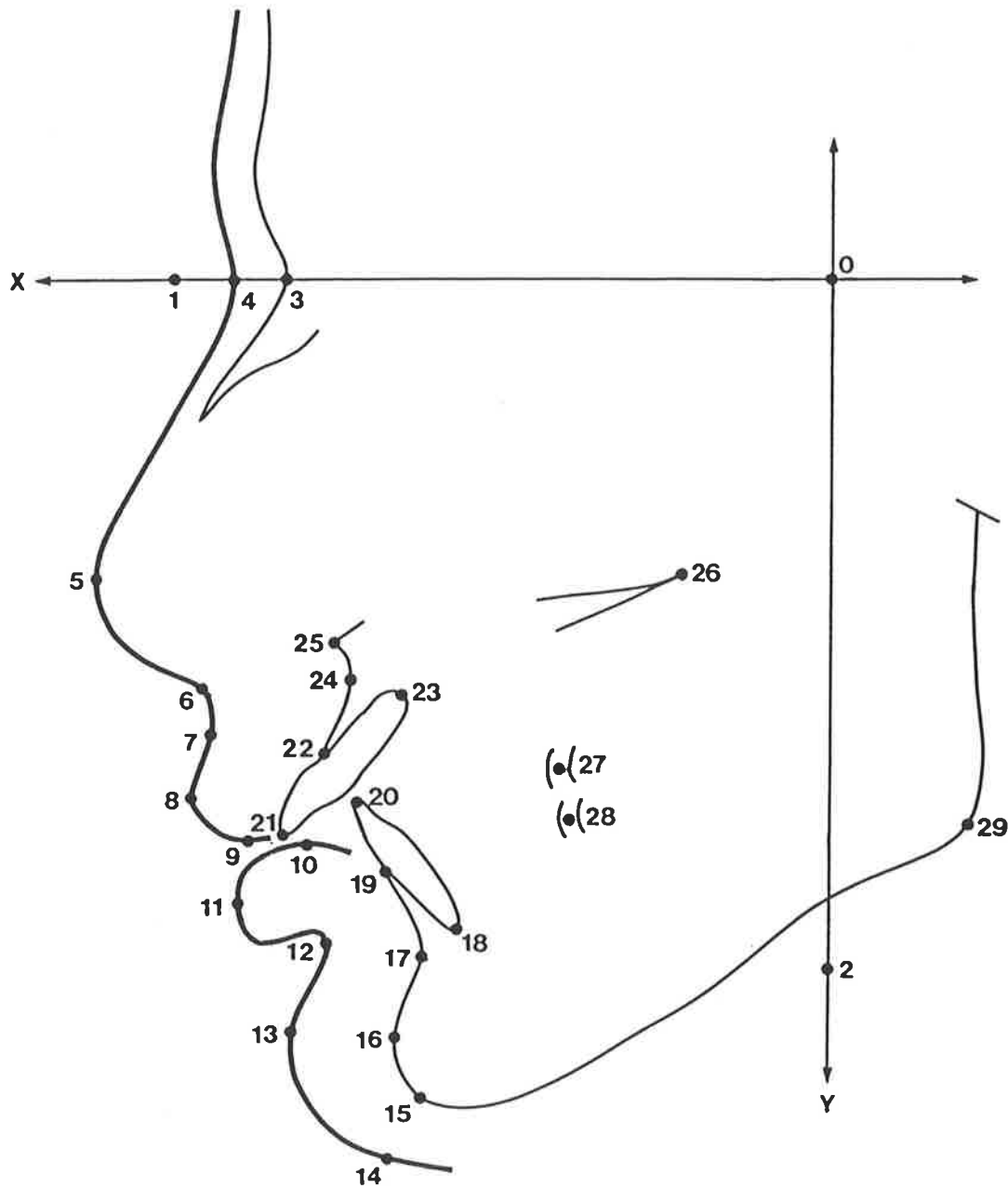


FIGURE a. Landmarks and Order of Digitizing.

APPENDIX 5

LANDMARK DEFINITIONS

A. Hard Tissue Points

The standard definitions of Riolo, Moyers et al. (1974) are provided. Where these differ significantly from those of Graber (1972), Krogman and Sassouni (1957) or Björk (1960) mention has been made; these authors have also been used to further clarify definitions.

Further clarifications are bracketed.

The points are defined in the order in which they were digitized.

The name of the point is followed by its symbol used in this study.

Alternative names are given in brackets.

1. Sella, S : The centre of the pituitary fossa of the sphenoid bone. Determined by inspection. Björk (1960) defined the upper limit of the fossa as a line between tuberculum sellae and dorsum sellae.
2. Nasion, N : The junction of the frontonasal suture at the most posterior point on the curve at the bridge of the nose. Krogman and Sassouni (1957) discussed the variation in definition of nasion and (as did Björk 1960) provided a more precise definition: "the point nasion is really the most anterior point of the naso-frontal suture seen from norma lateralis". The definition given by Graber (1972) "the intersection of the internasal suture and the nasofrontal suture" was a craniometric definition and is indistinguishable on the head film according to Krogman and Sassouni (1957).

3. Gnathion, G N : The most anterior-inferior point on the contour of the bony chin symphysis. Determined by bisecting the angle formed by the mandibular plane and a line through pogonion and nasion. Krogman and Sassouni (1957) discussed the variation and similarity of the definitions of gnathion and menton. Their conclusion concurred with the above. Graber (1972) and Björk (1960) however defined it as the lowest point on the outline of the symphysis. The former definition was used in this study.
4. Pogonion, P : The most anterior point on the contour of the bony chin. Determined by a tangent through nasion.
5. B point (supramentale), B : The point most posterior to a line from infradentale to pogonion on the anterior surface of the symphyseal outline of the mandible.
6. Lower incisor apex, R I : The root tip of the mandibular central incisor. When the root is not yet completed, the midpoint of the growing root tip is marked. (This point is related to the central incisor with the most anterior crown position).
7. Infradentale, P R I : The anterior superior point on the mandible (alveolar process) at its labial contact with the mandibular central incisor.
8. Lower incisor edge (incision inferius), I E I : The incisal tip of the mandibular central incisor. Krogman and Sassouni (1957) defined it more specifically as relating to the most anterior central

incisor. Björk (1960) specified it as the midpoint of the incisal edge.

9. Upper incisor incisal edge (incision inferius), I E S : The incisal tip of the maxillary central incisor. Krogman and Sassouni (1957) defined it more specifically as relating to the most anterior central incisor. Björk (1960) specified it as the midpoint of the incisal edge.
10. Prosthion (supradentale), P R : The most anterior inferior point on the maxilla (alveolar process) at its labial contact with the maxillary central incisor.
11. Upper incisor apex, R S : The root tip of the maxillary central incisor. In cases where the root is not yet completed, the midpoint of the growing root tip is marked. (In relation to the central incisor with the most anterior crown position).
12. A Point (Subspinale), A : The most posterior point on the maxilla between the anterior nasal spine and supradentale. Graber (1972) and Krogman and Sassouni (1957) related this to a line between prosthion and anterior nasal spine.
13. Anterior nasal spine, A N S : The tip of the median, sharp bony process of the maxilla at the lower margin of the anterior nasal opening.
14. Posterior nasal spine, P N S : The most posterior point at the sagittal plane on the bony hard palate.

15. Upper molar mesial contact, M S : The mesial contact (height of contour) of the maxillary first molar relative to the functional occlusal plane.
16. Lower molar mesial contact, M I : The mesial contact (height of contour) of the mandibular first molar relative to the functional occlusal plane.
17. Gonion, G O : The midpoint of the angle of the mandible. Found by intersecting the angle formed by the mandibular plane and a plane through articulate posterior and along the portion of the mandibular ramus inferior to it.

B. Soft Tissue Points

Where possible definitions are derived from Burstone (1959).

Other sources are indicated.

Further clarifications are bracketed.

The points are defined in the order in which they were digitized.

The name of the point is followed by the symbol used in this study.

1. Soft tissue nasion, N A S : The deepest concavity between the nose and the forehead (the depth of the nasal root). (Krogman and Sassouni, 1957).
2. Pronasale, P N : The most prominent point on the contour of the nose (De Laat 1974).
3. Subnasale, S N : The point where the maxillary lip and nasal septum form a definite angle. If the depression is a genital curve,

subnasale was interpreted as the most concave point in this area as measured by a line angled 45 degrees from the nasal floor.

4. Superior labial sulcus, S L S : The deepest point on the upper lip as determined by a line drawn from subnasale inclined so that it forms a tangent with labrale superius.
5. Labrale superius, L S : The most prominent point on the upper lip as measured from a perpendicular to the nasal floor.
6. Inferior aspect upper lip, I U L : A definition of this point could not be found in the literature, although it was commonly used. It could be defined as the most inferior point on the upper lip contour with relation to a horizontal plane of reference, for example S-N.
7. Superior aspect lower lip, S L L : A definition of this point could not be found in the literature, although it was commonly used. It could be defined as the most superior point on the lower lip contour with relation to a horizontal plane of reference, for example S-N.
8. Stomion, S T O : The junction in the midline of the upper and lower lips.
9. Labrale inferius, L I : The most prominent point on the lower lip as determined by a perpendicular from nasal floor.

10. Inferior labial sulcus, I L S : The most concave point as measured by a line tangent to menton point (soft tissue) and labrale inferius.
11. Soft tissue pogonion, P O S : The most anterior point on the chin as determined from a perpendicular to nasal floor.
12. Soft tissue gnathion, G N S : A definition of this point could not be found in the literature. De Laat (1974) used a point 2 cm. inferiorly from POS on the contour of the chin. It could be defined from the construction used in this study as the point on the chin contour at the intersection of a line through sella and gnathion.

C. Points Used For Plotting Purposes Only

These points, together with Sella (which defines the origin or (0,0)) define the x and y axes of the cartesian coordinate system.

The name is followed by the symbol used in this study.

X align, X : any point on the X axis (the pre-treatment S-N line) used to define the X axis in conjunction with Sella.

Y align, Y : any point on the Y axis (the pre-treatment S-N perpendicular through S) used to define the Y axis.

APPENDIX 6

LANDMARK LOCATION

Extremal landmarks (that is those points defined using terms as for example, most anterior, inferior) have been located in relation to the reference plane sella-nasion using tangents to the area of interest parallel to sella-nasion or sella-nasion perpendicular using a plastic protractor.

In those cases in which a parallel line failed to produce a tangent to the area of interest (due to the shape of the surface) a tangent was taken from another point. This method of location was used for both radiographs of the same subject. The points involved were: Pogonion, A point and B point (tangents to a line through nasion) and soft tissue pogonion, superior labial sulcus and inferior labial sulcus (tangents to a line through soft tissue nasion).

A. Hard Tissue Points

1. Sella, S : Selected as the geometric centre after tracing the internal anatomy of the pituitary fossa and extending the tracing superiorly to form a symmetrical ellipical shape. The definition allowed for some interpretation as the extent of the fossa was not strictly defined.
2. Nasion, N : As per the definition. The frontonasal suture was usually located in the most concave aspect of the curve of the nasal and frontal bones.

3. Gnathion, G N : Located in relation to the mandibular plane (for construction purposes taken as a tangent to the lower border of the mandible) and a tangent to pogonion through nasion. To bisect the angle between these two lines a line from sella to the junction of the lines was drawn. The point of intersection with the outer surface of the mandible was identified as gnathion.
4. Pogonion, P : The most anterior point on the bony chin in relation to a sella-nasion perpendicular.
5. B point (supramentale), B : The most posterior point located in relation to a sella-nasion perpendicular.
6. Lower incisor apex, R I : As per the definition.
7. Infradentale, P R I : As per the definition.
8. Lower incisor incisal edge (incision inferius) I E I : As per the definition.
9. Upper incisor edge (incision superius) I E S : As per the definition.
10. Prosthion (supradentale), P R : As per the definition.
11. Upper incisor apex, R S : As per the definition.
12. A point (Subspinale), A : The most posterior point in relation to a sella-nasion perpendicular.

13. Anterior nasal spine, A N S : As per the definition.
14. Posterior nasal spine, P N S : As per the definition.
15. Upper molar mesial contact, M S : The most convex aspect of the mesial crown surface of the first molars (second molars where the first molars were absent) was located; right and left images were averaged.
16. Lower molar mesial contact, M I : The most convex aspect of the mesial crown surface of the first molars (second molars where the first molars were absent) was located; the right and left images were averaged.
17. Gonion, GO: Located in relation to the mandibular plane (for construction purposes taken as a tangent to the lower border of the mandible) and a tangent to the posterior aspect of the ramus through articulare posterior. The angle between these lines was bisected and the intersection of the bisector with the inferior aspect of the mandible was identified as gonion. At all stages right and left sides were averaged.

B. Soft Tissue Points

1. Soft tissue nasion, N A S : The deepest concavity was located in relation to a sella-nasion perpendicular.
2. Pronasale, P N : The most prominent point was located in relation to a sella-nasion perpendicular.

3. Subnasale, S N : The deepest point in the curve between the upper lip and nose was found in relation to a line from pronasale to upper lip sulcus.
4. Superior labial sulcus, S L S : The deepest point on the upper lip was located in relation to a sella-nasion perpendicular.
5. Labrale superius, L S : The most prominent point on the lip was located in relation to a sella-nasion perpendicular.
6. Inferior aspect upper lip, I U L : The most inferior point was located in relation to sella-nasion.
7. Superior aspect lower lip, S L L : The most superior point was located in relation to sella-nasion.
8. Stomion, S T O : As per the definition.
9. Labrale inferius, L I : The most prominent point on the lip was located in relation to a sella-nasion perpendicular.
10. Inferior labial sulcus, I L S : The deepest point on the lower lip was located in relation to a sella-nasion perpendicular.
11. Soft tissue pogonion, P O S : The most prominent point on the chin was located in relation to a sella-nasion perpendicular.
12. Soft tissue gnathion, G N S : As per the definition (refer also to location of gnathion).

C. Points Used For Plotting Purposes Only

X align, X : Any point on the pre-treatment sella-nasion line was located. In the case of the pre-treatment radiograph nasion itself was usually used, in the post-treatment radiograph a point near nasion was used.

Y align, Y : Any point on the pre-treatment sella-nasion perpendicular line was located. The point was usually selected in the region of the lower border of the mandible.

APPENDIX 7

SUPERIMPOSITION TECHNIQUE

The technique used was that of Björk (1968) and Björk and Skieller (1983).

The procedure followed can be listed in stages:

1. A Björk transparent plastic sheet on which a thin black cross was marked was mounted on the viewing screen with tape.
2. The pre-treatment radiograph was examined and sella and nasion were identified and the points marked lightly on the film.
3. The pre-treatment radiograph was then secured with tape to the screen with sella at the centre of the cross and nasion lying on the X-axis.
4. Tracing paper was then secured to the screen with tape. Nasion, sella and Y align were transferred to the tracing paper.
5. The other points listed in figure a were then identified and marked according to the definitions and location specifications in appendices 5 and 6.
6. Relevant information was marked on the tracing paper, that is, the subjects name, age and identity number.
7. The tracing paper was removed.

8. The post-treatment radiograph was then superimposed on the pre-treatment radiograph. (For details see chapter 2.4).
9. The pre-treatment sella (intersection of the cross), a point on the X-axis near nasion (X-align) and a point on the Y-axis near the lower border of the mandible (Y-align) were then marked lightly on the post-treatment film.
10. Both films were then removed from the screen.
11. The post-treatment film was then replaced with the origin (pre-treatment sella) placed on the axis of the cross, and X-align and Y-align placed on the X and Y axes respectively and secured with tape.
12. Tracing paper was then secured with tape.
13. The points for the reference axes and landmarks were then traced. The landmarks were identified and traced according to the definitions and specifications listed in appendicies 5 and 6.
14. The subjects identification was marked.
15. The radiograph was removed and the marks on both films were erased.

APPENDIX 8

VARIABLE DESCRIPTIONS

A. Linear Variables(i) Horizontal

All measurements are perpendicular to the y-axis (sella-nasion perpendicular through nasion) defined by points 0 and 2, to the landmark. The name of the variable is followed by the abbreviation used for computing purposes.

VARIABLE NUMBER	VARIABLE NAME	VARIABLE ABBREVIATION	IDENTITY of LANDMARK
	horizontal distance to:		measured to 0, 2:
1	Soft tissue nasion	H ST NAS	4
2	Pronasale	H ST PN	5
3	Subnasale	H ST SN	6
4	Superior labial Sulcus	H ST SLS	7
5	Labrale superius	H ST LS	8
6	Inferior aspect upper lip	H ST IUL	9
7	Superior aspect lower lip	H ST SLL	10
8	Labrale inferius	H ST LI	11
9	Inferior labial sulcus	H ST ILS	12
10	Soft tissue pogonion	H ST POS	13
11	Soft tissue gnathion	H ST GNS	14

12	Nasion	H	HT	N	3
13	A point	H	HT	A	24
14	Upper incisor apex	H	HT	RS	23
15	Prosthion	H	HT	PR	22
16	Upper incisor incisal edge	H	HT	IES	21
17	Lower incisor incisal edge	H	HT	IEI	20
18	Infradentale	H	HT	PRI	19
19	Lower incisor apex	H	HT	RI	18
20	B point	H	HT	B	17
21	Pogonion	H	HT	P	16
22	Gnathion	H	HT	GN	15
23	Upper molar mesial contact	H	HT	MS	27
24	Lower molar mesial contact	H	HT	MI	28
25	Gonion	H	HT	GO	29

H = horizontal

HT = hard tissue

ST = soft tissue

(ii) Vertical

All measurements are perpendicular to the x-axis (sella-nasion) defined by points 0 and 1, to the landmark. The name of the variable is followed by the abbreviation used for computing purposes.

VARIABLE NUMBER	VARIABLE NAME	VARIABLE ABBREVIATION			IDENTITY of LANDMARK
	horizontal distance to:				measured to 0, 1:
26	Soft tissue nasion	V	ST	NAS	4
27	Pronasale	V	ST	PN	5
28	Subnasale	V	ST	SN	6
29	Superior labial sulcus	V	ST	SLS	7
30	Labrale superius	V	ST	LS	8
31	Inferior aspect upper lip	V	ST	IUL	9
32	Superior aspect lower lip	V	ST	SLL	10
33	Labrale inferius	V	ST	LI	11
34	Inferior labial sulcus	V	ST	ILS	12
35	Soft tissue pogonion	V	ST	POS	13
36	Soft tissue gnathion	V	ST	GNS	14
37	Nasion	V	HT	N	3
38	Anterior nasal spine	V	HT	ANS	25
39	A point	V	HT	A	24
40	Prosthion	V	HT	PR	22
41	Upper incisor incisal edge	V	HT	IES	21
42	Lower incisor incisal edge	V	HT	IEI	20

43	Infradentale	V	HT	PRI	19
44	B point	V	HT	B	17
45	Pogonion	V	HT	P	16
46	Gnathion	V	HT	GN	15
47	Upper molar mesial contact	V	HT	MS	27
48	Gonion	V	HT	GO	29

V = vertical

HT = hard tissue

ST = soft tissue

B. Angular Variables

The name of the variable is followed by the abbreviation used for computing purposes. Angular values are defined by 3 or 4 points. The literature source is provided.

VARIABLE NUMBER	VARIABLE NAME	VARIABLE ABBREVIATION			IDENTITY OF LANDMARK			AUTHOR
49	Mandibular plane to S-N	A	DS	MD-SN	3	0	15 29	Riedel (1952)
50	Palatal plane to S-N	A	DS	PA-SN	3	0	25 26	Krogman & Sassouni (1957)
51	Upper incisor to to S-N	A	DS	UI-SN	3	0	21 23	Steiner (1953)
52	Lower incisor to mandibular plane	A	DS	LI-MD	15	29	20 18	Steiner (1953)
53	Interincisal angle	A	DS	UI-LI	21	23	20 18	Downs (1948)
54	Occlusal plane	A	DS	OC-SN	3	0	21 27	Steiner (1953)
55	SNA	A	DS	SNA	0	3	24	Riedel (1952)
56	SNB	A	DS	SNB	0	3	17	Riedel (1952)
57	ANB	A	DS	ANB	24	3	17	Steiner (1953)
58	Convexity	A	SI	NAP	3	24	16	Downs (1948)

59	S-NAS-SLS	A	SI	SNSAS	0	4	7	Based on Reidel (1952)
60	S-NAS-ILS	A	SI	SNSBS	0	4	12	Based on Reidel (1952)
61	SLS-NAS-ILS	A	SC	ASNBS	7	4	12	Based on Reidel (1952)
62	Soft tissue convexity excluding nose	A	SC	CON	4	6	13	Subtelny (1959)
63	Soft tissue convexity including nose	A	SC	CONN	4	5	13	Subtelny (1959)
64	Nasolabial angle	A	SC	NASO	5	6	8	Based on Burstone (1967)
65	Concavity of upper lip	A	SC	ULIP	6	7	8	Burstone (1958)
66	Concavity of lower lip	A	SC	LLIP	11	12	13	Burstone (1958)

A = angular

DS = dentoskeletal variable

SI = soft tissue inclination

SC = soft tissue contour

SECTION 2

TABLES OF STATISTICAL ANALYSIS

All statistics were calculated from the total sample size of 30 males and 30 females.

	AGES AT PRE-TREATMENT RADIOGRAPHY			AGES AT POST-TREATMENT RADIOGRAPHY			DIFFERENCES		
	\bar{x}	S	Range	\bar{x}	S	Range	\bar{x}	S	Range
MALES n=30	13.7	1.4	11.4 to 16.8 (5.4)	15.6	1.2	13.8 to 18.9 (5.2)	1.9	0.5	1.1 to 2.8 (1.7)
FEMALES n=30	13.8	1.4	12.0 to 17.8 (5.8)	15.8	1.5	13.7 to 19.6 (5.9)	2.0	0.9	1.1 to 5.5 (4.4)

Appendix 9. Ages of the male and female samples calculated from the times of pre- and post-treatment radiography.

All differences between mean values of males and females are non-significant.

\bar{x} = mean, S = standard deviation.

APPENDIX 10

ANALYSIS OF ERRORS (ORIGINAL VS. RETRACED) BY 40 SETS OF DOUBLE DETERMINATIONS.

6 Tables, A to F

Legend \bar{x} = Mean.

S = Standard Deviation.

M diff = Mean difference between first and second determinations.

E(M diff) = Standard error of M diff.

t = Student's t Test

S(error) = Standard deviation of a single determination
(Dahlberg 1940)

E(var)% = Error variance per cent.

1% level t = 2.708, for degrees of freedom = 39

5% level t = 2.023, for degrees of freedom = 39

* mean difference from zero at probability < 0.05 level.

** mean difference from zero at probability < 0.01 level.

NS = Nasion-sella reference line.

NSP = Nasion-sella perpendicular reference line.

Variable descriptions are listed in appendix 8.

Variable		Sample		Double Determination - Total Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
1	Soft tissue nasion	73.09	3.88	-0.08	0.06	1.44	0.25	0.41
2	Pronasale	88.16	6.39	-0.15	0.06	2.53*	0.28	0.19
3	Subnasale	72.19	5.96	-0.11	0.07	1.58	0.31	0.28
4	Superior labial sulcus	69.90	6.15	-0.05	0.07	0.73	0.33	0.29
5	Labrale superius	71.80	6.72	-0.14	0.08	1.55	0.36	0.28
6	Inferior aspect upper lip	64.58	6.74	-0.12	0.10	1.20	0.45	0.44
7	Superior aspect lower lip	61.01	7.88	-0.20	0.12	1.74	0.53	0.45
8	Labrale inferius	65.60	7.29	-0.10	0.09	1.12	0.41	0.32
9	Inferior labial sulcus	54.88	7.67	-0.14	0.12	1.19	0.52	0.47
10	Soft tissue pogonion	55.71	9.01	-0.15	0.11	1.40	0.49	0.30
11	Soft tissue gnathion	42.65	9.88	-0.08	0.12	0.70	0.52	0.28

Table 10A. Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Sample		Double Determination - Total Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
12	Nasion	67.04	3.34	-0.02	0.04	0.57	0.20	0.31
13	A point	55.52	5.72	-0.02	0.16	0.13	0.51	0.78
14	Upper incisor apex	51.20	5.59	-0.21	0.10	2.06	0.47	0.71
15	Prosthion	57.46	6.31	-0.09	0.07	1.24	0.32	0.26
16	Upper incisor incisal edge	57.62	7.35	-0.11	0.09	1.26	0.41	0.31
17	Lower incisor incisal edge	53.85	6.68	-0.22	0.08	2.78**	0.38	0.33
18	Infradentale	49.09	7.21	-0.24	0.13	1.75	0.61	0.73
19	Lower incisor apex	37.85	7.33	0.08	0.20	0.40	0.88	1.44
20	B point	44.31	8.14	-0.11	0.10	1.04	0.45	0.31
21	Pogonion	43.80	8.73	-0.20	0.11	1.74	0.52	0.35
22	Gnathion	40.23	9.23	-0.15	0.12	1.28	0.53	0.33

Table 10B. Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Sample		Double Determination - Total Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
23	Upper molar mesial contact	33.17	5.31	-0.30	0.19	1.60	0.85	2.56
24	Lower molar mesial contact	32.33	5.60	-0.43	0.25	1.72	1.15	4.20
25	Gonion	16.26	3.55	-0.09	0.12	0.79	0.51	2.09

Table 10B. (continued) Horizontal location of hard tissue landmarks in relation to the NSP (mm).

Index	Variable	Sample		Double Determination - Total Error				
	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
26	Soft tissue nasion	6.35	3.28	0.42	0.14	3.07**	0.68	4.29
27	Pronasale	43.43	3.95	-0.06	0.09	0.64	0.38	0.93
28	Subnasale	55.11	3.96	0.17	0.08	2.25*	0.36	0.80
29	Superior labial sulcus	62.89	4.45	-0.02	0.12	0.19	0.52	1.37
30	Labrale superius	68.28	4.19	0.13	0.11	1.18	0.48	1.29
31	Inferior aspect upper lip	74.10	3.99	0.03	0.06	0.56	0.27	0.46
32	Superior aspect lower lip	76.00	4.17	-0.02	0.08	0.22	0.36	0.73
33	Labrale inferius	82.23	4.66	-0.01	0.06	0.21	0.27	0.33
34	Inferior labial sulcus	90.77	5.67	0.07	0.11	0.68	0.48	0.73
35	Soft tissue pogonion	99.45	5.73	0.02	0.16	0.12	0.70	1.46
36	Soft tissue gnathion	114.13	6.53	0.05	0.07	0.66	0.31	0.22

Table 10C. Vertical location of soft tissue landmarks in relation to NS (mm).

Index	Variable Name	Sample		Double Determination - Total Error				
		\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
37	Nasion	0.31	0.40	-0.01	0.04	0.18	0.17	17.71
38	Anterior nasal spine	49.00	3.58	-0.04	0.17	0.21	0.76	4.56
39	A point	55.57	4.13	0.50	0.27	1.85	1.25	9.11
40	Prosthion	64.57	3.67	0.00	0.08	0.04	0.36	0.96
41	Upper incisor incisal edge	77.02	4.05	-0.01	0.05	0.22	0.22	0.30
42	Lower incisor incisal edge	73.86	5.06	0.02	0.09	0.25	0.37	0.55
43	Infradentale	82.93	5.08	0.13	0.09	1.38	0.42	0.69
44	B point	91.10	5.49	0.17	0.14	1.24	0.61	1.25
45	Pogonion	102.16	6.49	0.27	0.11	2.35*	0.53	0.72
46	Gnathion	107.84	6.27	-0.03	0.05	0.61	0.23	0.13
47	Upper molar mesial contact	65.74	3.53	-0.53	0.14	3.92**	0.70	3.99
48	Gonion	66.94	4.93	0.15	0.16	0.97	0.69	1.98

Table 10D. Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Sample		Double Determination - Total Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
49	Mandibular Plane to S-N	36.02	6.08	-0.01	0.08	0.06	0.37	0.37
50	Palatal plane to S-N	7.57	3.73	0.05	0.26	0.19	1.13	9.28
51	Upper incisor to S-N	105.89	8.18	0.25	0.24	1.07	1.06	1.68
52	Lower incisor to mandibular plane	97.75	7.23	0.14	0.22	0.65	0.97	1.79
53	Interincisal angle	120.35	8.51	-0.39	0.30	1.28	1.37	2.60
54	Occlusal plane to S-N	25.09	6.16	0.82	0.29	2.81**	1.42	5.31
55	SNA	78.39	3.94	0.10	0.16	0.62	0.71	3.27
56	SNB	76.10	3.50	-0.05	0.06	0.81	0.28	0.62
57	ANB	2.29	2.75	0.15	0.16	0.94	0.71	6.76
58	Convexity	2.32	6.61	0.41	0.34	1.21	1.15	5.23

Table 10E. Dentoskeletal angles (degrees).

Variable		Sample		Double Determination - Total Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
59	S-NAS-SLS	91.66	3.64	0.26	0.08	3.45**	0.38	1.09
60	S-NAS-ILS	82.69	3.07	0.18	0.07	2.67*	0.33	1.17
61	SLS-NAS-ILS	8.96	1.77	0.07	0.04	1.97	0.17	0.97
62	Convexity excluding nose	160.87	4.49	-0.04	0.12	0.33	0.53	1.42
63	Convexity including nose	128.04	4.08	-0.07	0.12	0.62	0.53	1.69
64	Nasolabial angle	127.79	10.14	0.70	0.34	2.03	1.60	2.47
65	Concavity of upper lip	144.27	12.16	0.95	0.88	1.07	3.95	10.55
66	Concavity of lower lip	123.10	16.39	0.65	0.34	1.91	1.56	0.90

Table 10F. Soft tissue inclinations and contours (degrees).

APPENDIX 11

ANALYSIS OF DIGITIZING ERRORS (ORIGINAL VS. RETRACED) BY 20 SETS OF DOUBLE DETERMINATIONS.

6 Tables, A to F

Legend

\bar{x} = Mean.

S = Standard Deviation.

M diff = Mean difference between second and third determinations.

E(M diff) = Standard error of M diff.

t = Student's t Test

S(error) = Standard deviation of a single determination
(Dahlberg 1940)

E(var)% = Error variance per cent.

1% level t = 2.861, for degrees of freedom = 19

5% level t = 2.093, for degrees of freedom = 19

* mean difference from zero at probability < 0.05 level.

** mean difference from zero at probability < 0.01 level.

NS = Nasion-sella reference line.

NSP = Nasion-sella perpendicular reference line.

Variable descriptions are listed in appendix 8.

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
1	Soft tissue nasion	74.64	4.52	0.04	0.02	1.86	0.07	0.02
2	Pronasale	91.48	6.63	0.05	0.02	3.06**	0.06	0.01
3	Subnasale	75.16	6.30	-0.01	0.02	0.35	0.06	0.01
4	Superior labial sulcus	72.70	6.77	0.03	0.01	2.07	0.05	0.01
5	Labrale superius	74.81	7.76	0.02	0.02	1.06	0.06	0.01
6	Inferior aspect upper lip	67.32	7.56	0.01	0.02	0.62	0.06	0.01
7	Superior aspect lower lip	64.93	8.86	0.02	0.02	1.00	0.06	0.01
8	Labrale inferius	69.16	8.06	-0.01	0.01	0.55	0.06	0.01
9	Inferior labial sulcus	58.67	8.18	-0.01	0.02	0.71	0.04	0.00
10	Soft tissue pogonion	59.87	9.30	-0.01	0.02	0.45	0.06	0.00
11	Soft tissue gnathion	46.26	10.60	-0.02	0.02	0.79	0.08	0.00

Table 11A. Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
12	Nasion	68.01	3.95	0.02	0.02	1.82	0.06	0.04
13	A point	57.62	6.79	0.02	0.02	0.25	0.05	0.01
14	Upper incisor apex	53.11	6.89	0.00	0.02	0.01	0.06	0.01
15	Prosthion	59.54	7.25	0.02	0.02	0.94	0.05	0.01
16	Upper incisor incisal edge	60.03	8.07	0.02	0.02	1.19	0.05	0.00
17	Lower incisor incisal edge	56.38	7.83	0.04	0.02	2.56*	0.06	0.00
18	Infradentale	51.89	8.24	0.03	0.02	1.74	0.06	0.01
19	Lower incisor apex	40.53	8.21	0.00	0.02	0.12	0.05	0.00
20	B point	47.69	8.89	0.01	0.02	0.35	0.05	0.00
21	Pogonion	47.22	9.14	0.00	0.02	0.15	0.06	0.00
22	Gnathion	43.70	9.88	-0.01	0.02	0.47	0.06	0.00

Table 11B. Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
23	Upper molar mesial contact	35.44	5.95	-0.01	0.02	0.44	0.05	0.01
24	Lower molar mesial contact	35.21	6.66	0.03	0.02	0.44	0.06	0.01
25	Gonion	15.74	3.54	-0.02	0.02	1.63	0.06	0.03

Table 11B. (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
26	Soft tissue nasion	4.80	2.49	0.03	0.02	1.27	0.07	0.08
27	Pronasale	43.67	4.82	0.03	0.03	0.90	0.09	0.04
28	Subnasale	55.77	4.52	0.03	0.02	1.41	0.07	0.02
29	Superior labial sulcus	63.53	5.19	0.01	0.02	0.63	0.06	0.01
30	Labrale superius	69.59	4.54	0.02	0.02	1.05	0.07	0.02
31	Inferior aspect upper lip	75.23	4.21	0.04	0.02	1.85	0.07	0.02
32	Superior aspect lower lip	75.94	4.21	0.05	0.02	2.72*	0.07	0.02
33	Labrale inferius	81.79	4.69	0.04	0.02	1.54	0.08	0.03
34	Inferior labial sulcus	90.49	6.06	0.03	0.02	1.30	0.08	0.02
35	Soft tissue pogonion	99.67	5.88	0.03	0.02	1.72	0.06	0.01
36	Soft tissue gnathion	115.34	7.09	0.00	0.02	0.22	0.06	0.01

Table 11C. Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
37	Nasion	0.38	0.45	-0.00	0.02	0.18	0.07	2.28
38	Anterior nasal spine	50.08	4.04	0.01	0.02	0.05	0.07	0.03
39	A point	56.10	4.21	0.01	0.02	0.48	0.07	0.02
40	Prosthion	64.75	4.22	0.01	0.02	0.81	0.05	0.01
41	Upper incisor incisal edge	77.70	4.57	0.01	0.02	0.43	0.06	0.02
42	Lower incisor incisal edge	74.27	5.69	0.04	0.02	2.06	0.06	0.01
43	Infradentale	83.46	5.76	0.03	0.02	2.13*	0.06	0.01
44	B point	90.82	6.56	0.04	0.02	2.05	0.06	0.01
45	Pogonion	103.27	4.50	0.04	0.02	2.67*	0.06	0.01
46	Gnathion	109.03	6.94	0.01	0.02	0.50	0.06	0.01
47	Upper molar mesial contact	67.12	4.08	0.02	0.02	1.15	0.06	0.02
48	Gonion	69.01	4.57	0.04	0.03	1.48	0.09	0.04

Table 11D. Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
49	Mandibular Plane to S-N	34.07	6.70	-0.02	0.03	0.61	0.09	0.02
50	Palatal plane to S-N	7.33	3.45	0.01	0.64	0.13	0.12	0.01
51	Upper incisor to S-N	107.07	7.29	0.07	0.06	1.15	0.19	0.01
52	Lower incisor to mandibular plane	97.70	8.90	0.07	0.04	1.68	0.13	0.02
53	Interincisal angle	121.16	9.35	-0.12	0.07	1.67	0.23	0.06
54	Occlusal plane to S-N	23.53	5.53	-0.05	0.07	0.85	0.19	0.11
55	SNA	79.77	4.33	0.02	0.03	0.64	0.10	0.06
56	SNB	77.60	3.76	0.02	0.03	0.79	0.09	0.06
57	ANB	2.18	2.85	0.00	0.02	0.24	0.05	0.03
58	Convexity	2.01	3.70	0.01	0.05	0.23	0.15	0.05

Table 11E. Dentoskeletal angles (degrees).

Variable		Sample		Double Determination - Digitizing Error				
Index	Name	\bar{x}	S	M diff	E(M diff)	t	S(error)	E(var)%
59	S-NAS-SLS	91.85	2.90	0.03	0.02	1.17	0.07	0.04
60	S-NAS-ILS	83.07	1.96	0.01	0.02	0.39	0.06	0.04
61	SLS-NAS-ILS	8.78	1.96	0.02	0.02	1.29	0.06	0.08
62	Convexity excluding nose	160.25	4.47	0.07	0.04	1.87	0.13	0.08
63	Convexity including nose	127.28	4.08	-0.05	0.03	1.35	0.11	0.07
64	Nasolabial angle	127.66	10.90	-0.22	0.14	1.61	0.50	0.00
65	Concavity of upper lip	144.32	9.80	0.32	0.32	0.98	1.01	0.01
66	Concavity of lower lip	122.07	13.24	-0.16	0.16	1.01	0.50	0.00

Table 11F. Soft tissue inclinations and contours (degrees).

APPENDIX 12

COMPARISON OF MALES AND FEMALES BASED ON THE DIFFERENCE BETWEEN PRE- AND POST-TREATMENT VARIABLES

6 Tables, A to F.

Legend

\bar{x}	=	mean
E(M)	=	standard error of the mean
F	=	F ratio test
t	=	t-test
*	=	male/female difference significant at $p < 0.05$
**	=	male/female difference significant at $p < 0.01$

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
1	Soft tissue nasion	1.58	0.16	0.69	0.17	-	**
2	Pronasale	2.75	0.34	1.28	0.23	**	**
3	Subnasale	0.36	0.29	-0.23	0.20	**	-
4	Superior labial sulcus	-1.12	0.41	-1.49	0.24	**	-
5	Labrale superius	-1.60	0.58	-1.93	0.31	**	-
6	Inferior aspect upper lip	-2.74	0.67	-3.30	0.36	**	-
7	Superior aspect lower lip	0.54	0.77	-0.54	0.61	-	-
8	Labrale inferius	-0.63	0.60	-1.15	0.41	**	-
9	Inferior labial sulcus	-0.66	0.43	-0.24	0.34	-	-
10	Soft tissue pogonion	-0.74	0.43	-0.05	0.43	-	-
11	Soft tissue gnathion	-1.68	0.43	-0.69	0.45	-	-

Table 12A. Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
12	Nasion	1.23	0.11	0.61	0.11	-	**
13	A point	-2.77	0.48	-2.13	0.31	**	-
14	Upper incisor apex	-2.62	0.43	-1.46	0.35	-	*
15	Prosthion	-4.47	0.48	-3.64	0.23	**	-
16	Upper incisor incisal edge	-6.14	0.65	-5.83	0.39	**	-
17	Lower incisor incisal edge	-1.57	0.49	-0.94	0.36	*	-
18	Infradentale	-2.33	0.42	-1.58	0.33	-	-
19	Lower incisor apex	-3.28	0.43	-1.95	0.46	-	*
20	B point	-1.62	0.35	-0.74	0.32	-	-
21	Pogonion	-1.39	0.37	-0.43	0.38	-	-
22	Gnathion	-1.64	0.40	-0.61	0.41	-	-

Table 12B. Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
23	Upper molar mesial contact	0.92	0.44	0.77	0.40	-	-
24	Lower molar mesial contact	2.89	0.51	2.31	0.47	-	-
25	Gonion	2.67	0.38	1.24	0.28	*	**

Table 12B. (continued) Horizontal location of hard tissue landmarks in relation to the NSP (mm).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
26	Soft tissue nasion	-0.37	0.38	-0.12	0.32	-	-
27	Pronasale	2.77	0.33	1.91	0.27	-	*
28	Subnasale	3.90	0.38	2.00	0.25	**	**
29	Superior labial sulcus	5.27	0.58	2.37	0.31	**	**
30	Labrale superius	4.13	0.43	2.18	0.31	*	**
31	Inferior aspect upper lip	4.22	0.39	1.78	0.35	-	**
32	Superior aspect lower lip	3.64	0.40	0.98	0.43	-	**
33	Labrale inferius	3.58	0.40	1.49	0.46	-	**
34	Inferior labial sulcus	5.71	0.49	3.22	0.52	-	**
35	Soft tissue pogonion	6.34	0.54	3.23	0.61	-	**
36	Soft tissue gnathion	7.15	0.43	3.73	0.40	-	**

Table 12C. Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
37	Nasion	0.69	0.10	0.49	0.11	-	-
38	Anterior nasal spine	2.10	0.31	0.91	0.21	**	**
39	A point	3.17	0.43	1.58	0.45	-	*
40	Prosthion	3.23	0.30	1.76	0.32	-	**
41	Upper incisor incisal edge	3.53	0.32	2.01	0.35	**	*
42	Lower incisor incisal edge	7.57	0.49	5.44	0.40	-	**
43	Infradentale	6.82	0.40	4.40	0.36	-	**
44	B point	5.28	0.43	2.66	0.48	-	**
45	Pogonion	6.31	0.37	3.21	0.39	-	**
46	Gnathion	6.77	0.40	3.65	0.37	-	**
47	Upper molar mesial contact	3.62	0.36	1.64	0.28	*	**
48	Gonion	3.81	0.36	2.34	0.40	-	**

Table 12D. Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
49	Mandibular Plane to S-N	1.20	0.27	0.44	0.37	-	-
50	Palatal plane to S-N	0.63	0.30	0.23	0.20	**	-
51	Upper incisor to S-N	-8.07	1.45	-9.98	1.54	-	-
52	Lower incisor to mandibular plane	5.04	1.44	5.29	1.37	-	-
53	Interincisal angle	1.84	2.07	4.09	1.98	-	-
54	Occlusal plane to S-N	6.38	1.14	6.28	0.89	-	-
55	SNA	-3.19	0.49	-2.28	0.33	**	-
56	SNB	-0.71	0.21	-0.24	0.20	-	-
57	ANB	-2.47	0.40	-2.05	0.36	-	-
58	Convexity	-5.98	0.87	-5.19	0.93	-	-

Table 12E. Dentoskeletal angles (degrees).

Variable		Males		Females		Significance	
Index	Name	\bar{x}	$\pm E(M)$	\bar{x}	$\pm E(M)$	F	t
59	S-NAS-SLS	-2.49	0.34	-2.24	0.32	-	-
60	S-NAS-ILS	-0.84	0.22	-0.34	0.25	-	-
61	SLS-NAS-ILS	-1.88	0.31	-1.90	0.32	-	-
62	Convexity excluding nose	1.20	0.33	1.71	0.63	**	-
63	Convexity including nose	-0.95	0.35	-0.09	0.36	-	-
64	Nasolabial angle	6.65	1.65	5.15	0.87	**	-
65	Concavity of upper lip	-5.33	1.80	-1.97	2.14	-	-
66	Concavity of lower lip	7.76	2.05	7.26	2.01	-	-

Table 12F. Soft tissue inclinations and contours (degrees).

APPENDIX 13

DESCRIPTIVE STATISTICS

Each heading has 6 Tables, (i) to (vi)

- A. Males pre-treatment
- B. Females pre-treatment
- C. Males post-treatment
- D. Females post-treatment
- E. Males pre- and post-treatment differences
- F. Females pre- and post-treatment differences

Legends

\bar{x}	=	mean
E(M)	=	standard error of the mean
S	=	standard deviation
Min	=	minimum value
Max	=	maximum value
$\sqrt{b_1}$	=	skewness
*	=	skewness significant at $p < 0.05$
**	=	skewness significant at $p < 0.01$

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	72.7	0.69	1.4	66.0	82.7	-
2	Pronasale	87.7	0.98	3.8	79.0	101.1	*
3	Subnasale	72.9	0.96	5.3	64.6	84.8	-
4	Superior labial sulcus	70.8	1.08	5.3	61.7	83.7	-
5	Labrale superius	72.9	1.19	5.9	62.5	87.9	-
6	Inferior aspect upper lip	65.1	1.21	6.5	54.0	79.9	-
7	Superior aspect lower lip	60.4	1.42	6.6	47.5	79.9	*
8	Labrale inferius	65.5	1.34	7.8	54.9	82.3	*
9	Inferior labial sulcus	54.7	1.32	7.3	41.7	71.6	-
10	Soft tissue pogonion	56.1	1.47	7.2	42.2	74.9	-
11	Soft tissue gnathion	43.5	1.58	8.0	30.2	64.8	-

Table 13A(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	66.3	0.63	3.4	58.9	75.4	-
13	A point	56.8	0.94	5.1	47.8	68.3	-
14	Upper incisor apex	52.0	0.93	5.1	42.7	62.7	-
15	Prosthion	59.4	1.03	5.7	49.4	71.3	-
16	Upper incisor incisal edge	60.5	1.15	6.3	50.1	73.1	-
17	Lower incisor incisal edge	54.0	1.18	6.5	39.9	69.1	-
18	Infradentale	49.8	1.26	6.9	36.4	66.5	-
19	Lower incisor apex	39.0	1.29	7.1	25.8	56.5	-
20	B point	44.7	1.34	7.4	32.3	63.6	-
21	Pogonion	44.3	1.44	7.9	31.0	64.0	-
22	Gnathion	40.9	1.49	8.1	28.6	61.0	-

Table 13A(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	32.3	0.93	5.1	22.4	42.6	-
24	Lower molar mesial contact	30.1	1.02	5.6	19.3	42.5	-
25	Gonion	15.9	0.65	3.6	9.0	22.9	-

Table 13A(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
26	Soft tissue nasion	6.3	0.47	2.6	0.0	10.2	**
27	Pronasale	42.8	0.58	3.2	34.1	49.2	-
28	Subnasale	53.8	0.59	3.2	47.1	59.7	-
29	Superior labial sulcus	60.7	0.79	4.3	51.4	69.2	-
30	Labrale superius	67.1	0.61	3.3	61.9	75.2	-
31	Inferior aspect upper lip	72.1	0.63	3.5	65.8	80.1	-
32	Superior aspect lower lip	74.2	0.77	4.2	65.2	81.5	-
33	Labrale inferius	80.3	0.80	4.4	72.7	87.9	-
34	Inferior labial sulcus	87.7	1.00	5.5	77.5	98.9	-
35	Soft tissue pogonion	96.4	0.86	4.7	85.7	105.2	-
36	Soft tissue gnathion	111.1	1.02	5.6	99.4	123.3	-

Table 13A(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
37	Nasion	0.1	0.01	0.1	0.0	0.2	-
38	Anterior nasal spine	48.6	0.56	3.1	43.0	56.1	-
39	A point	54.3	0.53	2.9	49.1	61.9	-
40	Prosthion	62.8	0.56	3.1	57.8	70.5	-
41	Upper incisor incisal edge	75.4	0.62	3.4	69.9	84.4	-
42	Lower incisor incisal edge	69.7	0.77	4.2	61.8	78.1	-
43	Infradentale	79.2	0.78	4.3	70.2	88.3	-
44	B point	88.4	0.99	5.4	76.4	98.7	-
45	Pogonion	98.5	1.06	5.8	87.0	111.3	-
46	Gnathion	105.5	1.05	5.7	92.6	116.6	-
47	Upper molar mesial contact	63.6	0.64	3.5	56.2	69.9	-
48	Gonion	66.0	0.86	4.7	56.8	76.9	-

Table 13A(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	34.4	0.08	5.4	22.8	46.3	-
50	Palatal plane to S-N	7.8	0.73	4.0	-2.6	17.2	-
51	Upper incisor to S-N	110.7	1.18	6.5	97.3	126.7	-
52	Lower incisor to mandibular plane	95.9	1.21	6.6	83.0	105.0	-
53	Interincisal angle	119.1	1.64	9.0	104.2	134.4	-
54	Occlusal plane to S-N	22.7	0.86	4.8	11.6	32.0	-
55	SNA	80.1	0.75	4.1	71.8	87.5	-
56	SNB	76.2	0.64	3.5	70.0	84.7	-
57	ANB	3.9	0.53	2.9	-1.3	8.5	-
58	Convexity	6.0	1.26	6.9	-5.7	17.0	-

Table 13A(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics			Males pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	93.0	0.52	2.9	87.3	98.4	-
60	S-NAS-ILS	82.5	0.42	2.3	76.1	87.5	-
61	SLS-NAS-ILS	10.5	0.40	2.2	6.2	14.6	-
62	Convexity excluding nose	158.3	0.98	5.4	146.6	168.7	-
63	Convexity including nose	127.3	0.86	4.7	118.4	135.2	-
64	Nasolabial angle	126.0	1.88	10.3	110.7	148.2	-
65	Concavity of upper lip	145.0	2.01	11.0	115.3	172.2	-
66	Concavity of lower lip	115.9	2.71	14.8	85.3	141.0	-

Table 13A(vi) Soft tissue inclinations and contours (degrees).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	71.1	0.26	1.4	64.5	77.6	-
2	Pronasale	85.5	0.76	4.2	77.5	93.6	-
3	Subnasale	70.2	0.83	4.5	60.9	78.3	-
4	Superior labial sulcus	68.2	0.95	5.2	56.7	76.9	-
5	Labrale superius	70.1	1.00	5.5	58.0	79.0	-
6	Inferior aspect upper lip	63.4	0.99	5.4	49.3	73.7	-
7	Superior aspect lower lip	59.3	1.33	7.3	45.6	70.6	-
8	Labrale inferius	63.4	1.19	6.5	50.1	75.2	-
9	Inferior labial sulcus	53.2	1.27	7.0	36.6	64.7	-
10	Soft tissue pogonion	54.1	1.43	7.8	35.1	68.8	-
11	Soft tissue gnathion	42.0	1.53	8.4	19.4	59.7	-

Table 13B(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	65.1	0.45	2.5	59.6	70.3	-
13	A point	55.0	0.76	4.2	46.5	61.8	-
14	Upper incisor apex	50.5	0.74	4.1	42.3	58.2	-
15	Prosthion	57.5	0.90	5.0	46.8	65.3	-
16	Upper incisor incisal edge	58.8	1.31	6.2	45.4	71.0	-
17	Lower incisor incisal edge	52.3	1.04	5.7	39.3	61.9	-
18	Infradentale	47.8	1.07	5.8	33.8	57.7	-
19	Lower incisor apex	37.3	1.10	6.0	24.3	47.9	-
20	B point	43.2	1.20	6.6	27.6	56.0	-
21	Pogonion	42.8	1.36	7.5	23.1	58.9	-
22	Gnathion	39.5	1.44	7.9	18.4	56.2	-

Table 13B(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	31.5	0.72	4.0	23.4	39.7	-
24	Lower molar mesial contact	29.6	0.85	4.7	20.6	40.4	-
25	Gonion	15.5	0.82	4.5	6.4	23.1	-

Table 13B(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
26	Soft tissue nasion	6.1	0.48	2.6	0.1	12.7	-
27	Pronasale	41.8	0.56	3.1	36.7	51.0	*
28	Subnasale	53.1	0.54	3.0	47.3	59.8	-
29	Superior labial sulcus	60.7	0.54	2.9	54.7	68.6	-
30	Labrale superius	65.4	0.52	2.8	60.8	72.2	-
31	Inferior aspect upper lip	71.3	0.54	2.9	66.5	79.9	*
32	Superior aspect lower lip	72.9	0.74	4.1	66.4	80.7	-
33	Labrale inferius	78.6	0.84	4.6	71.6	87.7	-
34	Inferior labial sulcus	86.5	0.99	5.4	76.1	96.9	-
35	Soft tissue pogonion	95.6	1.05	5.7	83.3	103.7	-
36	Soft tissue gnathion	109.2	1.03	5.6	98.2	117.9	-

Table 13B(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
37	Nasion	0.1	0.01	0.1	0.0	0.2	*
38	Anterior nasal spine	47.5	0.44	2.4	42.4	53.2	-
39	A point	53.6	0.63	3.5	47.6	61.7	-
40	Prosthion	62.2	0.63	3.2	56.5	68.8	-
41	Upper incisor incisal edge	73.9	0.62	3.4	67.6	80.7	-
42	Lower incisor incisal edge	69.1	0.61	3.3	63.8	75.4	-
43	Infradentale	78.4	0.66	3.6	72.5	85.9	-
44	B point	86.8	0.83	4.6	78.0	94.9	-
45	Pogonion	97.2	0.89	4.7	88.4	104.4	-
46	Gnathion	102.6	0.88	4.8	93.7	110.9	-
47	Upper molar mesial contact	63.4	0.53	2.9	58.0	69.8	-
48	Gonion	64.9	0.84	4.6	52.8	73.2	-

Table 13B(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	34.6	1.09	6.0	23.4	50.8	-
50	Palatal plane to S-N	7.8	0.56	3.1	0.7	13.2	-
51	Upper incisor to S-N	111.2	1.49	8.2	97.3	135.0	-
52	Lower incisor to mandibular plane	97.5	0.82	4.5	90.1	107.2	-
53	Interincisal angle	117.5	1.24	6.8	103.4	132.1	-
54	Occlusal plane to S-N	21.4	0.99	5.4	11.5	31.8	-
55	SNA	79.5	0.52	2.9	74.9	85.0	-
56	SNB	75.9	0.59	3.2	67.7	82.9	-
57	ANB	3.5	0.34	1.8	-1.2	7.1	-
58	Convexity	5.0	0.92	5.1	-8.2	15.7	-

Table 13B(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics			Females pre-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	91.8	0.72	3.9	84.7	101.0	-
60	S-NAS-ILS	82.4	0.62	3.4	76.0	89.5	-
61	SLS-NAS-ILS	9.4	0.33	1.8	5.0	12.5	*
62	Convexity excluding nose	160.5	0.79	4.3	153.5	169.9	-
63	Convexity including nose	127.9	0.75	4.1	119.8	140.0	-
64	Nasolabial angle	127.6	1.56	8.5	105.2	149.5	-
65	Concavity of upper lip	141.9	2.50	13.7	110.3	172.4	-
66	Concavity of lower lip	122.21	2.66	14.56	86.2	154.7	-

Table 13B(vi) Soft tissue inclinations and contours (degrees).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	74.2	0.69	3.8	67.3	84.0	-
2	Pronasale	90.4	0.93	5.1	80.3	103.1	-
3	Subnasale	73.3	0.91	5.0	64.8	86.0	-
4	Superior labial sulcus	69.6	1.04	5.7	58.1	84.3	-
5	Labrale superius	71.3	1.15	6.3	59.2	88.7	-
6	Inferior aspect upper lip	63.3	1.25	6.9	46.8	83.0	-
7	Superior aspect lower lip	61.0	1.35	7.4	46.8	83.0	-
8	Labrale inferius	64.9	1.30	7.1	49.0	85.2	-
9	Inferior labial sulcus	54.1	1.37	7.5	36.4	75.7	-
10	Soft tissue pogonion	55.4	1.49	8.2	38.5	78.0	-
11	Soft tissue gnathion	41.9	1.70	9.3	24.6	68.5	-

Table 13C(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	67.6	0.65	3.6	61.3	76.8	-
13	A point	54.1	1.02	5.6	41.0	68.8	-
14	Upper incisor apex	49.3	1.00	5.5	37.7	61.6	-
15	Prosthion	54.9	1.09	6.0	40.9	70.6	-
16	Upper incisor incisal edge	54.4	1.26	8.9	37.7	74.0	-
17	Lower incisor incisal edge	52.5	1.26	6.9	34.1	71.3	-
18	Infradentale	47.4	1.31	7.2	30.9	68.9	-
19	Lower incisor apex	35.7	1.41	7.7	16.8	56.0	-
20	B point	43.1	1.43	7.8	26.5	66.2	-
21	Pogonion	43.0	1.53	8.4	27.3	67.2	-
22	Gnathion	39.3	1.59	8.7	23.1	64.1	-

Table 13C(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	33.2	1.02	5.6	22.5	47.6	-
24	Lower molar mesial contact	33.0	1.08	5.9	21.1	48.9	-
25	Gonion	18.6	0.73	4.0	11.4	28.8	-

Table 13C(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
26	Soft tissue nasion	6.0	0.42	2.3	0.2	11.3	-
27	Pronasale	45.6	0.66	3.6	37.5	52.7	-
28	Subnasale	57.7	0.68	3.7	50.7	64.4	-
29	Superior labial sulcus	66.0	0.72	4.0	57.6	74.9	-
30	Labrale superius	71.3	0.70	3.8	64.9	81.0	-
31	Inferior aspect upper lip	76.3	0.62	3.4	70.1	84.8	-
32	Superior aspect lower lip	77.9	0.74	4.0	70.1	84.9	-
33	Labrale inferius	83.8	0.86	4.7	76.7	92.3	-
34	Inferior labial sulcus	93.4	0.92	5.0	83.8	102.2	-
35	Soft tissue pogonion	102.8	0.95	5.2	91.3	112.4	-
36	Soft tissue gnathion	118.2	1.05	5.8	106.5	128.2	-

Table 13C(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Males post-treatment		$\sqrt{b_1}$
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	
37	Nasion	0.8	0.11	0.6	0.0	2.5	**
38	Anterior nasal spine	50.7	0.55	3.0	45.9	55.5	-
39	A point	57.5	0.65	3.6	50.2	66.5	-
40	Prosthion	66.1	0.60	3.3	61.7	74.8	-
41	Upper incisor incisal edge	78.9	0.65	3.5	73.5	88.1	-
42	Lower incisor incisal edge	77.3	0.67	3.6	70.6	85.8	-
43	Infradentale	86.0	0.74	4.1	78.2	95.5	-
44	B point	93.7	1.04	5.7	82.9	104.3	-
45	Pogonion	104.8	1.12	6.2	92.3	116.6	-
46	Gnathion	111.3	1.14	6.3	98.5	122.3	-
47	Upper molar mesial contact	67.3	0.66	3.6	59.8	75.4	-
48	Gonion	49.8	0.94	5.12	60.70	77.8	-

Table 13C(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	35.6	1.10	6.0	20.8	47.9	-
50	Palatal plane to S-N	8.4	0.73	4.0	-3.5	16.5	*
51	Upper incisor to S-N	102.6	1.37	7.5	90.2	125.5	-
52	Lower incisor to mandibular plane	100.9	1.71	9.4	87.4	117.7	-
53	Interincisal angle	120.9	1.67	9.1	97.8	139.5	-
54	Occlusal plane to S-N	29.1	1.26	6.9	16.9	43.0	-
55	SNA	76.9	0.73	4.0	67.7	85.7	-
56	SNB	75.5	0.66	3.6	67.3	83.1	-
57	ANB	1.4	0.44	2.4	-3.2	6.3	-
58	Convexity	0.0	1.08	5.9	-11.8	11.7	-

Table 13C(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics			Males post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	90.5	0.57	3.1	84.4	96.8	-
60	S-NAS-ILS	81.6	0.50	2.8	74.5	87.7	-
61	SLS-NAS-ILS	8.6	0.36	2.0	4.8	12.9	-
62	Convexity excluding nose	159.5	0.95	5.2	148.4	170.3	-
63	Convexity including nose	126.3	0.90	4.9	115.7	135.7	-
64	Nasolabial angle	132.7	1.59	8.7	112.1	145.6	-
65	Concavity of upper lip	139.6	1.54	8.4	114.9	154.5	*
66	Concavity of lower lip	123.6	2.65	14.5	92.7	151.1	-

Table 13C(vi) Soft tissue inclinations and contours (degrees).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	71.8	0.57	3.1	64.7	79.4	-
2	Pronasale	86.8	0.84	4.6	78.5	95.6	-
3	Subnasale	70.0	0.84	4.6	60.4	79.4	-
4	Superior labial sulcus	66.7	0.87	4.8	57.0	76.0	-
5	Labrale superius	68.1	0.95	5.2	57.2	78.9	-
6	Inferior aspect upper lip	60.1	1.00	5.5	45.8	71.8	-
7	Superior aspect lower lip	58.7	1.29	6.2	45.8	71.8	-
8	Labrale inferius	62.3	1.09	6.0	48.4	74.9	-
9	Inferior labial sulcus	53.0	1.31	7.2	34.6	67.5	-
10	Soft tissue pogonion	54.1	1.50	8.2	35.1	71.5	-
11	Soft tissue gnathion	41.3	1.74	9.5	18.4	61.4	-

Table 13D(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	65.7	0.49	2.7	59.8	71.4	-
13	A point	52.9	0.83	4.5	44.6	61.8	-
14	Upper incisor apex	49.0	0.81	4.4	41.1	58.9	-
15	Prosthion	53.8	0.91	5.0	43.2	64.2	-
16	Upper incisor incisal edge	52.9	1.02	5.6	39.2	63.7	-
17	Lower incisor incisal edge	51.3	1.02	5.6	37.8	61.4	-
18	Infradentale	46.3	1.07	5.9	31.8	58.7	-
19	Lower incisor apex	35.3	1.17	6.4	20.8	49.1	-
20	B point	42.4	1.30	7.1	27.0	57.4	-
21	Pogonion	42.4	1.51	8.3	23.3	60.2	-
22	Gnathion	38.9	1.63	9.0	17.5	57.6	-

Table 13D(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	32.2	0.88	4.8	23.7	40.6	-
24	Lower molar mesial contact	31.9	0.97	5.3	22.9	41.9	-
25	Gonion	16.7	0.88	4.9	7.9	22.9	-

Table 13D(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
26	Soft tissue nasion	5.9	0.47	2.6	1.2	13.8	*
27	Pronasale	43.7	0.53	2.9	36.5	50.7	-
28	Subnasale	55.1	0.50	2.7	50.0	60.9	-
29	Superior labial sulcus	63.1	0.53	2.9	57.3	71.2	-
30	Labrale superius	67.6	0.46	2.5	63.5	74.0	-
31	Inferior aspect upper lip	73.1	0.46	2.5	69.6	80.2	*
32	Superior aspect lower lip	73.9	0.57	3.1	69.8	80.2	*
33	Labrale inferius	80.1	0.61	3.4	75.4	88.1	*
34	Inferior labial sulcus	89.7	0.79	4.3	82.8	99.9	-
35	Soft tissue pogonion	98.8	0.83	4.6	89.0	107.6	-
36	Soft tissue gnathion	112.9	0.84	4.6	104.7	121.3	-

Table 13D(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
37	Nasion	0.6	0.11	0.6	0.2	2.9	**
38	Anterior nasal spine	48.4	0.42	2.3	43.8	53.0	-
39	A point	55.2	0.55	3.0	49.3	62.2	-
40	Prosthion	63.9	0.49	2.7	58.8	71.3	-
41	Upper incisor incisal edge	75.9	0.51	2.8	71.6	83.1	-
42	Lower incisor incisal edge	74.6	0.55	3.0	70.3	82.3	*
43	Infradentale	82.8	0.53	2.9	78.6	90.3	*
44	B point	89.5	0.81	4.4	82.3	100.0	-
45	Pogonion	100.4	0.82	4.5	92.5	110.5	-
46	Gnathion	106.3	0.78	4.3	98.7	114.0	-
47	Upper molar mesial contact	65.0	0.44	2.4	60.4	71.6	-
48	Gonion	67.2	0.94	5.2	53.4	76.3	-

Table 13D(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	35.0	1.28	7.0	22.1	52.7	-
50	Palatal plane to S-N	8.0	0.63	3.5	0.6	12.9	-
51	Upper incisor to S-N	101.2	1.17	6.4	90.2	120.7	*
52	Lower incisor to mandibular plane	102.8	1.44	7.9	86.5	118.2	-
53	Interincisal angle	121.6	1.74	9.5	100.1	141.1	-
54	Occlusal plane to S-N	27.6	1.09	6.0	18.2	42.7	-
55	SNA	77.1	0.66	3.6	72.1	85.3	*
56	SNB	75.7	0.66	3.6	66.5	84.6	-
57	ANB	1.5	0.43	2.3	-2.8	5.6	-
58	Convexity	-0.2	1.18	6.5	-14.9	10.6	-

Table 13D(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics			Females post-treatment		
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	89.6	0.63	3.5	82.5	96.5	-
60	S-NAS-ILS	82.1	0.66	3.6	72.9	89.9	-
61	SLS-NAS-ILS	7.4	0.25	1.4	5.2	10.6	-
62	Convexity excluding nose	162.2	0.95	5.2	150.9	171.4	-
63	Convexity including nose	127.8	0.86	4.7	118.4	139.8	-
64	Nasolabial angle	132.7	1.66	9.1	111.5	151.4	*
65	Concavity of upper lip	140.0	2.01	11.0	119.4	169.2	-
66	Concavity of lower lip	129.5	1.89	10.3	111.2	158.5	-

Table 13D(vi) Soft tissue inclinations and contours (degrees).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	1.6	0.16	0.9	0.3	3.9	-
2	Pronasale	2.8	0.34	1.8	-0.7	6.6	-
3	Subnasale	0.4	0.29	1.6	-4.3	4.0	-
4	Superior labial sulcus	-1.1	0.41	2.2	-7.4	3.4	-
5	Labrale superius	-1.6	0.58	3.2	-9.3	7.1	-
6	Inferior aspect upper lip	-2.7	0.67	3.7	-9.9	3.2	-
7	Superior aspect lower lip	0.5	0.77	4.2	-9.9	8.9	-
8	Labrale inferius	-0.6	0.60	3.3	-10.3	4.1	**
9	Inferior labial sulcus	-0.7	0.43	2.3	-6.5	4.0	-
10	Soft tissue pogonion	-0.7	0.43	2.4	-6.5	3.1	*
11	Soft tissue gnathion	-1.7	0.43	2.4	-6.5	3.7	-

Table 13E(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	1.2	0.11	0.6	0.4	2.5	-
13	A point	-2.8	0.49	2.7	-7.1	3.5	-
14	Upper incisor apex	-2.6	0.43	2.4	-7.2	2.5	-
15	Prosthion	-4.5	0.48	2.6	-10.0	0.3	-
16	Upper incisor incisal edge	-6.1	0.65	3.6	-13.0	0.9	-
17	Lower incisor incisal edge	-1.6	0.49	2.7	-6.7	3.8	-
18	Infradentale	-2.3	0.42	2.3	-8.0	2.4	-
19	Lower incisor apex	-3.3	0.43	2.4	-9.1	0.7	*
20	B point	-1.6	0.35	1.9	-5.8	2.6	-
21	Pogonion	-1.4	0.37	2.0	-5.5	3.2	-
22	Gnathion	-1.6	0.40	2.2	-6.0	3.1	-

Table 13E(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	0.9	0.44	2.4	-2.9	7.1	-
24	Lower molar mesial contact	2.9	0.51	2.8	-2.2	11.0	*
25	Gonion	2.7	0.38	2.1	-6.1	5.8	**

Table 13E(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
26	Soft tissue nasion	-0.4	0.38	2.1	-6.0	4.3	-
27	Pronasale	2.8	0.33	1.8	-0.3	6.9	-
28	Subnasale	3.9	0.38	2.1	0.2	9.1	-
29	Superior labial sulcus	5.3	0.58	3.2	-2.3	13.5	-
30	Labrale superius	4.1	0.43	2.4	-0.4	8.3	-
31	Inferior aspect upper lip	4.2	0.39	2.1	0.2	9.3	-
32	Superior aspect lower lip	3.6	0.40	2.2	0.2	9.0	-
33	Labrale inferius	3.6	0.40	2.2	-0.9	7.5	-
34	Inferior labial sulcus	5.7	0.49	2.7	-0.3	10.6	-
35	Soft tissue pogonion	6.3	0.54	3.0	1.4	13.6	-
36	Soft tissue gnathion	7.2	0.43	2.3	2.3	12.0	-

Table 13E(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
37	Nasion	0.7	0.10	0.6	-0.1	2.4	**
38	Anterior nasal spine	2.1	0.31	1.7	-1.3	5.4	-
39	A point	3.2	0.43	2.4	-2.9	7.5	-
40	Prosthion	3.2	0.30	1.7	-0.1	6.7	-
41	Upper incisor incisal edge	3.5	0.32	1.8	-1.4	7.2	-
42	Lower incisor incisal edge	7.6	0.49	2.7	1.1	12.4	-
43	Infradentale	6.8	0.40	2.2	1.1	12.5	-
44	B point	5.3	0.43	2.4	-0.5	10.9	-
45	Pogonion	6.3	0.37	2.0	1.9	10.2	-
46	Gnathion	6.8	0.40	2.2	1.6	9.8	-
47	Upper molar mesial contact	3.6	0.36	2.0	0.0	7.7	-
48	Gonion	3.8	0.36	2.0	0.3	8.1	-

Table 13E(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	1.2	0.27	1.5	-2.1	3.9	-
50	Palatal plane to S-N	0.6	0.30	1.6	-3.0	4.0	-
51	Upper incisor to S-N	-8.1	1.45	7.9	-21.6	12.1	-
52	Lower incisor to mandibular plane	5.0	1.44	7.9	-9.7	22.5	-
53	Interincisal angle	1.8	2.07	11.3	-25.7	24.8	-
54	Occlusal plane to S-N	6.4	1.14	6.3	-4.9	20.5	-
55	SNA	-3.2	0.49	2.7	-8.1	4.5	*
56	SNB	-0.7	0.21	1.1	-3.7	0.9	-
57	ANB	-2.5	0.40	2.2	-6.1	3.9	-
58	Convexity	-6.0	0.87	4.8	-14.9	8.1	-

Table 13E(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics		Males pre-and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	-2.5	0.34	1.9	-5.9	2.5	-
60	S-NAS-ILS	-0.8	0.22	1.2	-4.1	1.0	-
61	SLS-NAS-ILS	-1.9	0.31	1.7	-5.5	2.0	-
62	Convexity excluding nose	1.2	0.33	1.8	-1.8	6.6	*
63	Convexity including nose	-1.0	0.35	1.9	-5.6	2.3	-
64	Nasolabial angle	6.7	1.65	9.0	-25.9	22.2	**
65	Concavity of upper lip	-5.3	1.79	9.8	-43.0	12.4	**
66	Concavity of lower lip	7.8	2.05	11.2	-12.3	31.1	-

Table 13E(vi) Soft tissue inclinations and contours (degrees).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
1	Soft tissue nasion	0.7	0.17	0.9	-0.9	2.4	-
2	Pronasale	1.3	0.23	1.3	-0.6	4.3	*
3	Subnasale	-0.2	0.20	1.1	-1.9	2.3	*
4	Superior labial sulcus	-1.5	0.24	1.3	-4.7	1.4	-
5	Labrale superius	-1.9	0.31	1.7	-5.4	1.5	-
6	Inferior aspect upper lip	-3.3	0.36	2.0	-7.0	0.1	-
7	Superior aspect lower lip	-0.5	0.61	3.4	-5.3	5.6	-
8	Labrale inferius	-1.2	0.41	2.3	-4.6	4.1	-
9	Inferior labial sulcus	-0.2	0.34	1.9	-2.6	3.6	-
10	Soft tissue pogonion	-0.1	0.43	2.4	-3.3	6.2	-
11	Soft tissue gnathion	-0.7	0.45	2.5	-4.5	4.0	-

Table 13F(i) Horizontal location of soft tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
12	Nasion	0.6	0.11	0.6	-0.8	2.0	-
13	A point	-2.1	0.31	1.7	-5.6	3.0	-
14	Upper incisor apex	-1.5	0.35	1.9	-5.0	4.3	*
15	Prosthion	-3.6	0.23	1.3	-6.1	0.1	-
16	Upper incisor incisal edge	-5.8	0.39	2.1	-10.4	-2.3	-
17	Lower incisor incisal edge	-0.9	0.36	2.0	-5.4	1.9	-
18	Infradentale	-1.6	0.33	1.8	-5.4	1.8	-
19	Lower incisor apex	-2.0	0.46	2.5	-6.8	2.8	-
20	B point	-0.7	0.32	1.8	-4.0	3.1	-
21	Pogonion	-0.4	0.38	2.1	-3.8	3.5	-
22	Gnathion	-0.6	0.41	2.2	-3.9	3.9	-

Table 13F(ii) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
23	Upper molar mesial contact	0.8	0.40	2.2	-3.3	4.2	-
24	Lower molar mesial contact	2.3	0.44	2.4	-2.8	6.7	-
25	Gonion	1.2	0.28	1.5	-2.8	4.6	-

Table 13F(ii) (continued) Horizontal location of hard tissue landmarks in relation to NSP (mm).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{D_1}$
26	Soft tissue nasion	-0.1	0.32	1.7	-5.7	2.6	*
27	Pronasale	1.9	0.27	1.5	-0.5	5.5	-
28	Subnasale	2.0	0.25	1.4	-0.3	5.8	-
29	Superior labial sulcus	2.4	0.31	1.7	-0.8	5.5	-
30	Labrale superius	2.2	0.31	1.7	-1.0	5.1	-
31	Inferior aspect upper lip	1.8	0.35	1.9	-2.2	6.0	-
32	Superior aspect lower lip	1.0	0.43	2.3	-4.3	4.7	-
33	Labrale inferius	1.5	0.46	2.5	-5.5	5.7	-
34	Inferior labial sulcus	3.2	0.52	2.8	-1.7	9.4	-
35	Soft tissue pogonion	3.2	0.61	3.4	-3.9	10.3	-
36	Soft tissue gnathion	3.7	0.40	2.2	0.4	8.2	-

Table 13F(iii) Vertical location of soft tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
37	Nasion	0.5	0.11	0.6	-1.0	2.9	**
38	Anterior nasal spine	0.9	0.21	1.1	-0.9	3.1	-
39	A point	1.6	0.45	2.5	-5.1	7.5	-
40	Prosthion	1.8	0.32	1.8	-2.1	5.8	-
41	Upper incisor incisal edge	2.0	0.35	1.9	-1.6	7.0	-
42	Lower incisor incisal edge	5.4	0.40	2.2	1.7	9.9	-
43	Infradentale	4.4	0.36	2.0	0.7	7.6	-
44	B point	2.7	0.48	2.7	-3.7	7.8	-
45	Pogonion	3.2	0.39	2.2	-1.4	7.4	-
46	Gnathion	3.7	0.37	2.0	0.4	7.5	-
47	Upper molar mesial contact	1.6	0.28	1.5	-1.8	5.0	-
48	Gonion	2.3	0.40	2.2	-1.8	7.7	-

Table 13F(iv) Vertical location of hard tissue landmarks in relation to NS (mm).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
49	Mandibular Plane to S-N	0.4	0.35	1.9	-5.8	2.7	**
50	Palatal plane to S-N	0.2	0.20	1.1	-1.3	3.3	*
51	Upper incisor to S-N	-10.0	1.54	8.5	-31.8	2.4	-
52	Lower incisor to mandibular plane	5.3	1.37	7.5	-5.8	21.2	-
53	Interincisal angle	4.1	1.98	10.8	-13.5	30.8	-
54	Occlusal plane to S-N	6.3	0.89	4.9	-2.7	15.3	-
55	SNA	-2.3	0.33	1.8	-5.8	3.6	*
56	SNB	-0.2	0.20	1.1	-1.8	3.3	-
57	ANB	-2.1	0.36	2.0	-6.3	1.9	-
58	Convexity	-5.2	0.93	5.1	-18.0	4.4	-

Table 13F(v) Dentoskeletal angles (degrees).

Variable		Descriptive Statistics		Females pre- and post-treatment differences			
Index	Name	\bar{x}	$\pm E(M)$	S	Min	Max	$\sqrt{b_1}$
59	S-NAS-SLS	-2.2	0.32	1.7	-5.2	1.8	-
60	S-NAS-ILS	-0.3	0.25	1.4	-3.2	2.6	-
61	SLS-NAS-ILS	-1.9	0.32	1.7	-4.9	3.1	-
62	Convexity excluding nose	1.7	0.63	3.4	-6.6	8.7	-
63	Convexity including nose	-0.1	0.36	2.0	-4.4	3.7	-
64	Nasolabial angle	5.2	0.87	4.8	-7.3	13.5	*
65	Concavity of upper lip	-2.0	2.14	11.7	-19.6	39.0	-
66	Concavity of lower lip	7.3	2.01	11.0	-14.4	31.9	-

Table 13F(vi) Soft tissue inclinations and contours (degrees).

APPENDIX 14

RATIOS FOR INCISOR : LIP RETRACTIONS

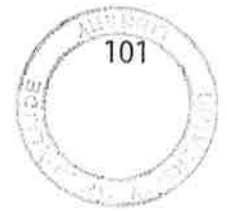
Ratios have been calculated using post- minus pre-treatment mean values for variables 5, 8, 16 and 17 (Appendix 13E and 13F)

These ratios can be compared to previous studies (Appendix 1)

- U1 = upper incisor (incisal edge, 16)
 UL = upper lip (labrale superius, 5)
 L1 = lower incisor (incisal edge, 17)
 LL = lower lip (labrale inferius, 8)

	U1:UL	UL:LL	L1:LL
MALES	3.8:1	2.7:1	2.5:1
FEMALES	3:1	1.6:1	0.8:1

Appendix 14. Ratios for incisor : lip retractions.



APPENDIX 15

CORRELATION COEFFICIENTS

The coefficients were calculated for the differences between pre- and post-treatment variables (as in Appendix 13E and 13F).

- A. Coefficients involving horizontal soft tissue variables.
6 Tables, (i) to (vi).
- B. Coefficients involving vertical soft tissue variables.
5 Tables, (i) to (v).
- C. Coefficients involving soft tissue angular variables.
4 Tables, (i) to (iv).
- D. Coefficients involving hard tissue variables.
3 Tables, (i) to (iii).

Legend

- M = males
- F = females
- * = coefficients significant at $p < 0.05$
- ** = coefficients significant at $p < 0.01$

Coefficients often reported in previous studies have been outlined in the tables.

Variable abbreviations are listed in Appendix 8.

			1 NAS	2 PN	3 SN	4 SLS	5 LS	6 IUL	7 SLL	8 LI	9 ILS	10 POS	11 GNS
1	NAS	M		.86**	.59**	.30	.20	.21	.29	.30	.31	.41*	.34*
		F		.53**	.43**	.21	.39*	.49**	.13	.28	.35*	.41*	.32*
2	PN	M			.74**	.50**	.36*	.33*	.34*	.43**	.37*	.50**	.36*
		F			.50**	.19	.23	.24	.12	.11	.39*	.54**	.53**
3	SN	M				.83**	.75**	.67**	.55**	.78**	.65**	.73**	.64**
		F				.73**	.71**	.66**	.26	.41*	.43**	.31*	.26
4	SLS	M					.94**	.79**	.50**	.82**	.67**	.71**	.63**
		F					.89**	.73**	.35**	.59**	.29	.19	.10
5	LS	M						.80**	.36**	.72**	.54**	.58**	.54**
		F						.83**	.21	.56**	.37*	.30	.26
6	IUL	M							.20	.67**	.59**	.59**	.66**
		F							.04	.49**	.25	.18	.11
7	SLL	M								.78**	.68**	.64**	.47**
		F								.72**	.54**	.25	-.06
8	LI	M									.84**	.83**	.71**
		F									.70**	.40*	.10
9	ILS	M										.94**	.84**
		F										.81**	.57**
10	POS	M											.87**
		F											.83**
11	GNS	M											
		F											

Table 15A(i) Correlation coefficients for the differences between horizontal soft tissue variables measured pre- and post-treatment in males and females.

			26	27	28	29	30	31	32	33	34	35	36
			NAS	PN	SN	SLS	LS	IUL	SLL	LI	ILS	POS	GNS
1	NAS	M	-.36*	.55**	.52**	.23	.59**	.49**	.51**	.48**	.42*	.58**	.66**
		F	.30	.37*	.39*	-.12	.37*	.28	.47**	.51**	.32*	.41*	.59**
2	PN	M	-.49**	.49**	.51**	.23	.53**	.52**	.56**	.56**	.47**	.62**	.68**
		F	-.36*	.24	.60**	.17	.50**	.33*	.43*	.40*	.38*	.49**	.66**
3	SN	M	-.59**	.09	-.07	-.20	.09	.27	.38*	.36*	.14	.27	.23
		F	.06	.10	.01	.06	.32*	.40*	.31*	.25	.18	.20	.39*
4	SLS	M	-.43**	-.19	-.22	-.43**	-.16	.12	.13	.19	.01	.02	-.04
		F	-.05	.00	.04	.16	.26	.48**	.26	.18	-.02	-.06	.20
5	LS	M	-.29	-.26	-.37*	-.60**	-.31*	.03	.06	.22	-.02	.00	-.11
		F	-.03	.01	.06	-.08	.13	.33*	.28	.34*	.13	.09	.34*
6	IUL	M	-.20	-.30	-.37*	-.58**	-.34*	-.13	.02	.17	.00	.02	-.20
		F	.17	.07	.07	.00	.25	.38*	.40	.39*	.23	.16	.41*
7	SLL	M	-.63**	.10	.00	.00	.11	.28	.28	-.18	-.16	-.22	.03
		F	.05	.18	.10	.24	.34	.44**	.06	-.23	-.07	-.28	.06
8	LI	M	-.61**	-.08	-.17	-.25	-.06	.23	.12	.00	-.13	-.15	-.11
		F	.12	.12	.10	.14	.34	.46**	.09	-.04	.03	-.15	.28
9	ILS	M	-.63**	-.04	-.10	-.16	-.03	.17	-.07	-.19	-.16	-.19	-.11
		F	-.04	.15	.10	-.04	.16	.20	-.12	-.08	.03	.02	.34*
10	POS	M	-.72**	.06	-.01	-.09	.01	.22	.08	-.01	-.08	-.09	.04
		F	-.13	.17	.26	-.10	.10	.03	-.12	-.06	-.16	.02	.26
11	GNS	M	-.57**	-.15	-.26	-.29	-.21	-.07	.07	.04	-.03	.00	-.09
		F	-.30	.03	.20	-.23	-.14	-.20	-.05	.14	-.03	.28	.21

Table 15A(ii) Correlation coefficients for horizontal soft tissue pre- and post-treatment differences and vertical soft tissue pre- and post-treatment differences in males and females.

			12	13	14	15	16	17	18	19	20	21	22	23	24	25
			N	A	RS	PR	IES	IEI	PRI	RI	B	P	GN	MS	MI	GO
1	NAS	M	.72**	.10	-.06	-.06	-.17	-.04	.08	.07	.30	.36*	.33*	.33*	.37*	.17
		F	.82**	.44**	.35*	.42*	.11	.08	.36*	.37*	.24	.34*	.32*	.21	.09	.12
2	PN	M	.53**	.16	.03	.01	-.14	-.05	.20	.14	.32*	.40*	.36*	.45**	.46**	.10
		F	.63**	.30	.33*	.24	.01	.21	.36*	.32*	.34*	.47**	.50**	.38*	.40*	-.02
3	SN	M	.25	.53**	.35*	.46**	.31*	.38*	.59**	.54**	.63**	.69**	.64**	.44**	.42**	-.27
		F	.39*	.44**	.42*	.62**	.33*	.19	.32*	.47**	.27	.27	.28	.04	.13	-.01
4	SLS	M	-.09	.67**	.50**	.65**	.54**	.50**	.69**	.58**	.64**	.68**	.66**	.23	.32*	-.41*
		F	.17	.20	.07	.53**	.66**	.32*	.33*	.42*	.10	.16	.15	-.26	.20	.01
5	LS	M	-.13	.73**	.57**	.69**	.57**	.50**	.65**	.54**	.57**	.60**	.58**	.08	.19	-.40*
		F	.29	.27	.11	.61**	.64**	.34*	.46**	.48**	.28	.31*	.29	-.20	-.05	-.07
6	IUL	M	-.08	.71**	.54**	.73**	.73**	.62**	.75**	.65**	.70**	.70**	.68**	.15	.31	-.56**
		F	.35*	.33*	.23	.57**	.45**	.21	.32*	.37*	.07	.14	.13	-.18	-.08	-.01
7	SLL	M	.02	.32*	.37*	.27	.12	.30	.34*	.16	.44**	.44**	.46**	.32*	.46**	-.21
		F	.14	.28	.23	.31*	.21	.41*	.42*	.29	.14	-.03	-.01	-.25	-.08	.24
8	LI	M	-.07	.58**	.54**	.58**	.45**	.51**	.65**	.51**	.69**	.71**	.72**	.32*	.46**	-.47**
		F	.30	.22	-.03	.37*	.41*	.44**	.61**	.57**	.24	.18	.17	-.37*	-.11	.09
9	ILS	M	-.02	.48**	.44**	.49**	.42*	.45**	.60**	.47**	.79**	.81**	.86**	.44**	.60**	-.58**
		F	.35*	.24	.02	.26	.18	.30	.67**	.72**	.76**	.64**	.62**	.06	.34*	-.22
10	POS	M	.10	.49**	.46**	.51**	.42*	.41*	.66**	.59**	.84**	.88**	.89**	.48**	.60**	-.52**
		F	.37*	.06	-.09	.13	.22	.11	.59**	.67**	.80**	.87**	.86**	.40*	.38*	-.49*
11	GNS	M	.12	.66**	.57**	.68**	.60**	.53**	.77**	.67**	.95**	.97**	.99**	.46**	.54**	-.69**
		F	.23	-.01	-.15	.11	.24	.13	.49**	.59**	.87**	.98**	.99**	.60**	.44**	-.62**

Table 15A(iii) Correlation coefficients for horizontal soft tissue pre- and post-treatment differences and horizontal hard tissue pre- and post-treatment differences in males and females.

			37	38	39	40	41	42	43	44	45	46	47	48
			N	ANS	A	PR	IES	IEI	PRI	B	P	GN	MS	GO
1	NAS	M	.11	.52**	.47**	.45**	.31*	.34*	.38*	.27	.42*	.64**	.58**	.68**
		F	.52**	.35*	.48**	.59**	.54**	.21	.19	.34	.52**	.50**	.43**	.32*
2	PN	M	.17	.50**	.56**	.46**	.26	.27	.25	.37*	.52**	.68**	.56**	.76**
		F	.27	.40*	.46**	.62**	.66**	.29	.40*	.39*	.48**	.50**	.37*	.50**
3	SN	M	-.10	.12	.14	-.05	-.16	-.16	-.15	.21	.15	.25	.31*	.60**
		F	.33*	.21	.27	.35*	.47**	.04	.16	.27	.32*	.39*	.05	.39*
4	SLS	M	-.09	-.08	-.06	-.31*	-.35*	-.28	-.32*	.08	.11	.05	.03	.45**
		F	.39*	.16	.11	.07	.20	-.06	.02	.15	.10	.25	-.03	.24
5	LS	M	-.18	-.10	-.09	-.38*	-.41*	-.35	-.37*	.00	.00	-.05	-.06	.34*
		F	.50**	.16	.14	.13	.23	.04	.09	.15	.16	.31*	.10	.39*
6	IUL	M	-.27	-.11	-.02	-.45**	-.50**	-.46	-.46**	-.18	-.05	-.15	-.02	.31*
		F	.44**	.21	.21	.29	.37*	.10	.17	.34	.25	.37*	.12	.37*
7	SLL	M	.37*	.05	-.10	-.10	.01	.11	.13	.34*	-.08	.00	.00	.34*
		F	.08	.02	.28	.12	.19	.05	.01	.09	.31*	.25	-.11	.06
8	LI	M	.09	-.06	-.17	-.31*	-.25	-.19	-.20	.17	-.07	-.09	.01	.37*
		F	.22	.05	.39*	.19	.27	.19	.11	.24	.41	.46**	-.20	.34*
9	ILS	M	.06	-.10	-.18	-.39*	-.36*	-.20	-.12	.09	.02	-.09	.02	.43**
		F	.26	.06	.36*	.22	.23	.13	.11	.05	.40*	.45**	.03	.60**
10	POS	M	.04	.03	-.07	-.25	-.28	-.22	-.13	.13	.06	.05	.14	.53**
		F	.49	.11	.23	.16	.10	-.10	-.05	-.13	.25	.27	.28	.66**
11	GNS	M	-.16	-.09	-.16	-.45**	-.52**	-.41*	-.30	-.06	-.04	-.15	.16	.56**
		F	.34	.13	.08	.03	-.03	-.11	.02	-.28	.07	.09	.39*	.75**

Table 15A(iv) Correlation coefficients for horizontal soft tissue pre- and post-treatment differences and vertical hard tissue pre- and post-treatment differences in males and females.

			59	60	61	62	63	64	65	66
			SNSAS	SNSBS	ASNBS	CON	CONN	NASO	ULIP	LLIP
1	NAS	M	-.26	-.39*	-.15	.16	-.02	.03	.15	-.14
		F	-.20	-.19	-.34*	.40	.43**	-.24	-.33*	-.09
2	PN	M	-.03	-.39*	.03	-.01	-.13	-.05	.12	-.29
		F	-.44**	-.11	-.34*	.34*	.04	.18	-.22	.07
3	SN	M	.33*	-.11	.33*	-.32*	.18	-.39*	-.10	-.53**
		F	.33*	.27	.11	-.29	.01	-.23	-.08	.01
4	SLS	M	.63**	.16	.61**	-.32*	.16	-.66**	-.12	-.52**
		F	.61**	.14	.49**	-.37*	.04	-.54**	.25	-.40*
5	LS	M	.70**	.22	.69**	-.35*	.14	-.85**	-.42*	-.54**
		F	.42*	.19	.26	-.16	.27	-.71**	-.18	-.32*
6	IUL	M	.56**	.40*	.45**	-.15	.14	-.63**	-.28	-.35*
		F	.37*	.20	.21	-.13	.20	-.61**	-.13	-.26*
7	SLL	M	.09	-.08	-.04	-.19	.33*	-.07	.24	-.27
		F	.25	.42*	-.09	-.15	-.08	-.17	.34*	.03
8	LI	M	.40*	.13	.23	-.21	.38*	-.39*	.05	-.44
		F	.36	.58**	-.11	-.00	.22	-.47**	.15	-.12
9	ILS	M	.15	.32	-.11	.15	.60**	-.22	.18	-.03
		F	-.08	.66**	-.61**	.40*	.48**	-.23	-.25	.24
10	POS	M	.20	.18	-.04	.15	.56**	-.21	.08	-.24
		F	-.24	.33*	-.50**	.66**	.54**	-.12	-.30	-.14
11	GNS	M	.20	.21	-.03	.30	.63**	-.29	.03	-.20
		F	-.38*	.09	-.45**	.69**	.62**	-.09	-.49*	-.08

Table 15A(v) Correlation coefficients for horizontal soft tissue pre- and post-treatment differences and soft tissue angular pre- and post-treatment differences in males and females.

			49	50	51	52	53	54	55	56	57	58
			MD-SN	PA-SN	U1-SN	L1-MD	U1-L1	OC-SN	SNA	SNB	ANB	NAP
1	NAS	M	-.37*	.09	-.14	-.10	.21	-.02	.07	.25	-.05	-.11
		F	-.25	-.26	-.15	-.28	.38*	.03	.35*	.26	.19	.10
2	PN	M	-.24	.19	-.18	-.17	.27	.04	.14	.26	.04	-.02
		F	-.30	-.05	-.22	-.14	.35*	.27	.20	.28	.04	-.09
3	SN	M	-.43**	.01	.05	-.05	.06	-.29	.48**	.54**	.30	.27
		F	-.17	-.39*	-.07	.34*	.26	.20	.37*	.24	.21	.19
4	SLS	M	-.44**	-.15	.19	.05	-.11	-.42*	.65**	.61**	.48**	.47**
		F	-.12	-.23	.39*	-.27	-.20	-.15	.20	.17	.09	.06
5	LS	M	-.40*	-.13	.18	.05	-.11	-.45**	.74**	.54**	.62**	.60**
		F	-.25	-.23	.36*	-.18	-.14	-.22	.22	.31*	.04	.01
6	IUL	M	-.49**	-.25	.44**	.08	-.30	-.62**	.69**	.61**	.53**	.50**
		F	-.16	-.22	.15	-.18	.01	-.07	.28	.17	.17	.14
7	SLL	M	-.36*	.12	-.17	.27	-.02	.02	.23	.45**	.05	.11
		F	-.04	-.34*	-.05	-.09	-.02	-.02	.39*	.27	.21	.28
8	LI	M	-.51**	-.15	.07	.16	-.09	-.32*	.51**	.69**	.26	.29
		F	-.15	-.22	.20	-.08	-.17	-.06	.28	.34*	.07	.11
9	ILS	M	-.58**	-.02	.15	.11	-.10	-.33*	.37*	.70**	.09	.09
		F	-.44**	-.29	.01	-.16	.19	.00	.23	.71**	-.71	-.12
10	POS	M	-.60**	-.03	.13	-.03	.01	-.33*	.39*	.74**	.09	.09
		F	-.70**	-.29	.17	-.31	.27	-.16	.04	.75**	-.37*	-.46**
11	GNS	M	-.75**	-.11	.25	-.01	-.07	-.57**	.51**	.73**	-.24	.23
		F	-.83**	-.30	.20	-.16	.20	-.26	-.07	.70**	-.45**	-.57**

Table 15A(vi) Correlation coefficients for horizontal soft tissue pre- and post-treatment differences and dentoskeletal angular pre- and post-treatment differences in males and females.

			26	27	28	29	30	31	32	33	34	35	36
			NAS	PN	SN	SLS	LS	IUL	SLL	LI	ILS	POS	GNS
26	NAS	M		-.27	-.11	-.14	-.18	-.30	-.29	-.15	-.09	-.06	-.25
		F	.31*	-.14	.11	.16	.17	.00	-.04	-.11	-.05	-.01	
27	PN	M			.82**	.60**	.81**	.65**	.36*	.25	.37*	.33*	.68**
		F		.70**	.38*	.65**	.63**	.57**	.44**	.42*	.37*	.51**	
28	SN	M				.75**	.89**	.74**	.34*	.24	.41*	.44**	.75**
		F			.42*	.74**	.58**	.65**	.53**	.49**	.50**	.71**	
29	SLS	M					.75**	.61**	.23	.04	.13	.26	.54**
		F				.67**	.66**	.37*	.11	.18	.04	.30	
30	LS	M						.82**	.37*	.22	.35*	.47**	.73**
		F					.89**	.67**	.39*	.45**	.32*	.69**	
31	IUL	M							.32*	.22	.22	.31*	.60**
		F						.66**	.37*	.42*	.24	.62**	
32	SLL	M								.82**	.65**	.58**	.68**
		F							.81**	.72**	.63**	.71**	
33	LI	M									.79**	.73**	.69**
		F								.80**	.80**	.70**	
34	ILS	M										.73**	.72**
		F									.78**	.75**	
35	POS	M											.78**
		F											.75**
36	GNS	M											
		F											

Table 15B(i) Correlation coefficients for the differences between vertical soft tissue variables measured pre- and post-treatment in males and females.

			12	13	14	15	16	17	18	19	20	21	22	23	24	25
			N	A	RS	PR	IES	IEI	PRI	RI	B	P	GN	MS	MI	GO
26	NAS	M	-.23	-.18	-.28	-.20	-.03	-.06	-.40*	-.39*	-.49**	-.57**	-.56**	-.59**	-.47**	.22
		F	.16	.11	.02	.11	.08	-.43	.31	-.08	-.24	-.26	-.28	-.09	-.20	.20
27	PN	M	.49**	-.39*	-.40*	-.54**	-.59**	-.45**	-.39*	-.29	-.15	-.15	-.15	.13	.12	.46**
		F	.57**	-.16	-.03	-.13	.05	-.07	.01	.21	.05	.02	.04	.02	.09	.34*
28	SN	M	.41*	-.49**	-.53**	-.63**	-.60**	-.54**	-.49**	-.38*	-.26	-.25	-.23	.11	.14	.52**
		F	.64**	-.11	-.05	-.08	.11	.10	.16	.16	.01	.16	.18	.08	.13	.28
29	SLS	M	.32*	-.61**	-.55**	-.69**	-.63**	-.61**	-.51**	-.26	-.30	-.28	-.28	.27	.08	.43**
		F	.14	-.16	-.08	-.20	.04	.01	-.21	-.17	-.31	-.28	-.24	-.22	-.27	.34*
30	LS	M	.39*	-.45**	-.51**	-.66**	-.68**	-.59**	-.52**	-.35*	-.24	-.19	-.21	.18	.14	.52**
		F	.64**	.02	.12	.08	.08	.10	.10	.09	-.24	-.15	-.13	-.22	-.12	.51**
31	IUL	M	.31*	-.16	-.23	-.41*	-.49**	-.49**	-.38*	-.13	-.11	-.05	-.05	.15	.13	.38*
		F	.52**	.06	.08	.21	.30	.17	.18	.23	-.17	-.19	-.18	-.37	-.23	.52**
32	SLL	M	.44**	.19	.10	.00	-.10	.08	.13	.08	.12	.09	.03	.18	.18	.33*
		F	.52**	.07	.26	.20	.12	.28	.17	.06	-.17	-.11	-.08	.02	-.04	.44**
33	LI	M	.46**	.26	.13	.10	-.10	.10	.19	.14	.08	.09	.02	.09	.06	.26
		F	.55**	.00	.09	.15	.11	.33	.21	.11	.01	.09	.10	.06	.06	.33
34	ILS	M	.33*	.07	-.03	-.05	-.12	.04	.05	-.12	-.02	-.06	-.04	-.08	.02	.31*
		F	.44**	.14	.14	.10	-.14	.42	.24	.04	-.03	-.08	-.07	-.17	.08	.40*
35	POS	M	.49**	-.10	-.28	-.25	-.26	-.24	-.08	-.11	-.02	.03	-.03	.21	.12	.27
		F	.44**	.06	.10	.12	-.08	.08	.14	.19	.12	.20	.22	.17	.16	.16
36	GNS	M	.56**	-.22	-.32	-.40	-.45**	-.37*	-.21	-.18	-.11	-.06	-.11	.16	.16	.50**
		F	.73**	.21	.19	.24	.06	.18	.36	.37	.14	.20	.18	-.04	.18	.30

Table 15B(ii) Correlation coefficients for vertical soft tissue pre- and post-treatment differences and horizontal hard tissue pre- and post-treatment differences in males and females.

			37	38	39	40	41	42	43	44	45	46	47	48
			N	ANS	A	PR	IES	IEI	PRI	B	P	GN	MS	GO
26	NAS	M	.01	-.01	.04	-.06	.03	-.02	-.00	-.40*	-.09	-.17	-.24	-.50**
		F	.12	.26	.27	.15	.00	-.09	-.07	.11	.29	.14	.07	-.15
27	PN	M	.27	.62**	.50**	.69**	.63**	.53**	.60**	.40*	.42*	.66**	.44**	.39*
		F	.27	.59**	.48**	.50**	.52**	.35	.48**	.43**	.69**	.56**	.51**	.30
28	SN	M	.42*	.64**	.60**	.74**	.69**	.63**	.66**	.37*	.66**	.78**	.48**	.34*
		F	.29	.63**	.51**	.63**	.62**	.48**	.58**	.55**	.68**	.66**	.62**	.38*
29	SLS	M	.32*	.45**	.45**	.65**	.66**	.43*	.54**	.39*	.38*	.53**	.40*	.20
		F	.07	.42**	.52**	.44**	.37*	.26	.31	.31*	.40*	.34*	.00	-.07
30	LS	M	.34*	.59**	.51**	.68**	.69**	.58**	.65**	.48**	.56**	.74**	.52**	.38*
		F	.23	.60**	.68**	.77**	.81**	.48**	.53**	.72**	.79**	.77**	.31	.17
31	IUL	M	.41*	.56**	.43*	.55**	.61**	.45**	.55**	.49**	.54**	.67**	.33*	.29
		F	.20	.54**	.64**	.60**	.67**	.33*	.39*	.58**	.69**	.68**	.18	.15
32	SLL	M	.27	.49**	.57**	.59**	.50**	.49**	.46**	.49**	.34*	.61**	.49**	.49**
		F	.23	.59**	.45**	.67**	.73**	.47**	.59**	.62**	.60**	.58**	.51**	.26
33	LI	M	-.01	.46**	.57**	.55**	.35*	.37*	.32*	.41*	.44**	.64**	.52**	.49**
		F	.27	.62**	.36*	.58**	.60**	.55**	.65**	.52**	.49**	.50**	.49**	.38*
34	ILS	M	.11	.49**	.49**	.52**	.34*	.58**	.50**	.51**	.67**	.65**	.59**	.47**
		F	-.01	.54**	.44**	.65**	.73**	.80**	.78**	.67**	.61**	.63**	.31*	.32*
35	POS	M	-.09	.42*	.61**	.48**	.27	.40*	.34*	.36*	.61**	.73**	.76**	.60**
		F	-.05	.58**	.44**	.59**	.55**	.49**	.61**	.50**	.59**	.57**	.55**	.51**
36	GNS	M	.19	.66**	.68**	.75**	.61**	.66**	.66**	.63**	.72**	.95**	.72**	.61**
		F	.26	.56**	.68**	.86**	.83**	.61**	.68**	.74**	.86**	.91**	.45**	.53**

Table 15B(iii) Correlation coefficients for vertical soft tissue pre- and post-treatment differences and vertical hard tissue pre- and post-treatment differences in males and females.

			59 SNSAS	60 SNSBS	61 ASNBS	62 CON	63 CONN	64 NASO	65 ULIP	66 LLIP
26	NAS	M	.08	.41*	.18	-.04	-.58**	-.03	-.30	.23
		F	.52**	.59**	.05	-.04	.06	-.23	.07	.00
27	PN	M	-.35*	-.47**	-.39*	.09	-.07	.24	.25	.14
		F	.02	.31*	-.22	.22	.23	-.30	-.04	.07
28	SN	M	-.39*	-.39*	-.36*	.21	-.25	.45**	.43**	.23
		F	-.27	-.07	-.21	.39*	.16	-.09	-.04	-.07
29	SLS	M	-.36*	-.43**	-.47**	.17	-.13	.71**	.52**	.19
		F	.31*	.16	.18	-.18	-.33*	.08	.46**	.02
30	LS	M	-.39*	-.44**	-.35*	.08	-.15	.43**	.47**	.19
		F	.14	.22	-.04	-.01	-.13	-.05	.31*	.06
31	IUL	M	-.11	-.34*	-.11	-.15	-.10	.16	.19	-.04
		F	.35*	.30	.11	-.17	-.08	-.32	.38*	.03
32	SLL	M	-.04	-.49**	-.04	-.10	-.15	.11	.09	-.33
		F	-.02	-.06	.03	-.00	.10	-.28	.01	-.01
33	LI	M	.09	-.41*	.15	-.02	-.20	-.14	-.18	-.36*
		F	-.16	-.05	-.11	.20	.35*	-.37*	-.31*	.08
34	ILS	M	-.13	-.18	-.16	.20	-.10	.04	.09	.16
		F	-.27	.11	-.35*	.09	.19	-.19	-.33*	.50**
35	POS	M	-.14	-.34*	-.06	.21	-.16	.10	.02	-.03
		F	-.31	.04	-.34*	.36*	.41	-.07	-.39*	.41*
36	GNS	M	-.24	-.51**	-.21	.17	-.13	.22	.15	-.02
		F	-.19	.25	-.40*	.30	.32	-.23	-.29	.28

Table 15B(iv) Correlation coefficients for vertical soft tissue pre- and post-treatment differences, and soft tissue angular pre- and post-treatment differences in males and females.

			49	50	51	52	53	54	55	56	57	58
			MD-SN	PA-SN	U1-SN	L1-MD	U1-L1	OC-SN	SNA	SNB	ANB	NAP
26	NAS	M	.34*	-.17	.20	.12	-.26	-.06	-.08	-.42*	.12	.12
		F	.10	-.02	.00	-.24	.08	-.13	.24	-.06	.26	.27
27	PN	M	-.04	.35*	-.30	-.24	.38*	.41*	-.29	.07	-.39*	-.41
		F	-.26	-.10	.01	-.14	.06	-.12	-.02	.39*	-.23	-.19
28	SN	M	.14	.27	-.22	-.26	.32*	.40*	-.41	-.08	-.46**	-.49**
		F	-.20	.16	.09	-.03	-.03	-.14	-.06	.26	-.19	-.28
29	SLS	M	.10	.19	-.24	-.41*	.44**	.45**	-.56**	-.12	-.62**	-.61**
		F	.16	.20	.03	-.01	-.21	.10	.04	-.05	.06	.06
30	LS	M	.08	.26	-.34*	-.31	.44**	.43**	-.38*	-.06	-.44**	-.47**
		F	.11	-.04	-.12	-.14	.01	.14	.14	.07	.09	.06
31	IUL	M	.01	.19	-.34*	-.39*	.50**	.33*	-.09	.13	-.18	-.22
		F	.09	-.13	.05	-.25	-.09	.00	.21	.15	.12	.14
32	SLL	M	-.03	.24	-.19	.10	.07	.09	.18	.13	.16	.18
		F	-.05	-.04	-.13	.02	.01	.04	.13	.11	.07	.05
33	LI	M	.06	.14	-.10	-.02	.08	-.06	.29	.06	.32*	.30
		F	-.20	.17	-.06	.24	-.07	.00	-.03	.14	-.10	-.11
34	ILS	M	.14	.22	-.11	.12	-.01	-.06	.11	.04	.11	.10
		F	.05	.19	-.27	.40	-.06	.20	.14	.13	.06	.12
35	POS	M	.09	.01	-.08	-.25	.22	-.06	-.07	-.07	-.05	-.11
		F	-.18	.25	-.23	.07	.20	.01	.05	.17	-.05	-.09
36	GNS	M	.15	.28	-.24	-.28	.34*	.21	-.17	-.02	-.19	-.23
		F	-.06	.01	-.14	-.08	.20	.15	.21	.28	.04	.01

Table 15B(v) Correlation coefficients for vertical soft tissue pre- and post-treatment differences and dentoskeletal angular pre- and post-treatment differences in males and females.

	59 SNSAS	60 SNSBS	61 ASNBS	62 CON	63 CONN	64 NASO	65 ULIP	66 LLIP
59 SNSAS M		.33*	.78**	-.39*	-.11	-.71**	-.33*	-.55**
59 SNSAS F		.40*	.68**	-.57**	-.22	-.43**	.48**	-.30
60 SNSBS M			.05	.15	.14	-.30	-.21	.41*
60 SNSBS F			-.41*	.15	.36*	-.36*	-.11	.37*
61 ASNBS M				-.65**	-.35*	-.69**	-.34*	-.66**
61 ASNBS F				-.69**	-.51**	-.14	.56**	-.60**
62 CON M					.43**	.29	.17	.50**
62 CON F					.72**	-.01	-.43**	.03
63 CONN M						-.02	.13	.16
63 CONN F						-.44**	-.49**	.05
64 NASO M							.62**	.39*
64 NASO F							.19	.25
65 ULIP M								.28
65 ULIP F								-.29
66 LLIP M								
66 LLIP F								

Table 15C(i) Correlation coefficients for the differences between soft tissue angular variables measured pre- and post-treatment in males and females.

		12	13	14	15	16	17	18	19	20	21	22	23	24	25	
		N	A	RS	PR	IES	IEI	PRI	RI	B	P	GN	MS	MI	GO	
59	SNSAS	M	-.41*	.47**	.35*	.49**	.52**	.40*	.45**	.42*	.30	.28	.22	-.13	-.03	-.26
		F	-.24	.07	-.12	.23	.51**	-.10	-.20	-.03	-.31	-.34*	-.34*	-.41*	-.37	.13
60	SNSBS	M	-.50**	.29	.21	.35*	.50**	.48**	.25	.05	.25	.16	.25	-.26	.05	-.44**
		F	.17	.10	-.10	.17	.18	.05	.27	.38*	.34	.16	.13	-.21	.10	.03
61	ASNBS	M	-.30	.39*	.22	.41*	.40*	.21	.29	.34*	.03	.06	-.01	-.21	-.26	-.06
		F	.37*	-.15	-.04	.10	.37*	-.14	-.42*	-.33*	-.58**	-.46**	-.44**	-.24	-.44**	.11
62	CON	M	.18	-.12	-.04	-.09	-.04	.01	.03	-.14	.25	.24	.28	.15	.30	-.19
		F	.34*	-.18	-.30	-.20	-.06	-.04	.35*	.35*	.56**	.67**	.67**	.43**	.28	-.35*
63	CONN	M	.06	.22	.28	.31*	.28	.28	.41*	.36*	.56**	.58**	.62**	.31	.29	-.47**
		F	.28	-.15	-.29	.05	.17	.10	.52**	.63**	.64**	.65**	.63**	.15	.08	-.31
64	NASO	M	.22	-.63**	-.49**	-.57**	-.48**	-.42*	-.42*	-.29	-.31	-.31	-.30	.23	.07	.30
		F	-.16	.01	.15	-.36*	-.64**	-.28	-.35*	-.39*	-.21	-.14	-.11	.27	.05	-.07
65	ULIP	M	.01	-.38*	-.37*	-.29	-.21	-.13	-.10	-.12	-.02	-.03	.00	.25	.21	.13
		F	-.27	-.13	-.10	-.09	.12	.02	-.22	-.21	-.51**	-.46**	-.44**	-.24	-.41*	.29
66	LLIP	M	-.11	-.36*	-.33*	-.37*	-.26	-.20	-.42*	-.52**	-.28	-.32*	-.18	-.14	-.05	.11
		F	.01	.20	.19	-.02	-.44	.08	.01	-.04	.12	-.11	-.10	-.15	.22	.16

Table 15C(ii) Correlation coefficients for angular soft tissue pre- and post-treatment differences and horizontal hard tissue pre- and post-treatment differences in males and females.

		37	38	39	40	41	42	43	44	45	46	47	48	
		N	ANS	A	PR	IES	IEI	PRI	B	P	GN	MS	GO	
59	SNSAS	M	-.18	-.08	-.04	-.37*	-.29	-.42*	-.41*	.01	-.16	-.18	-.20	.10
		F	.11	.11	.00	-.16	-.14	-.23	-.21	.03	.00	.01	-.22	-.15
60	SNSBS	M	-.06	-.27	-.24	-.65**	-.51**	-.25	-.18	-.23	-.05	-.41*	-.31*	-.19
		F	.11	.24	.42*	.22	.16	.18	.11	.16	.51	.46**	-.02	.35*
61	ASNBS	M	-.24	-.17	-.07	-.25	-.25	-.40*	-.49**	-.17	-.07	-.09	-.21	-.06
		F	.02	-.08	-.33*	-.33*	-.27	-.37*	-.30	-.10	-.40	-.36*	-.20	-.43**
62	CON	M	-.01	.09	.06	-.03	-.09	.17	.24	-.01	.12	.06	.28	.29
		F	.22	.22	.27	.18	.02	.08	.11	-.08	.27	.20	.47**	.52**
63	CONN	M	-.29	-.27	-.43**	-.44**	-.43**	-.16	-.10	.10	-.15	-.23	.14	.22
		F	.30	.15	.15	.08	-.03	.07	.11	-.09	.25	.27	.44*	.61**
64	NASO	M	.23	.12	.15	.40*	.39*	.34*	.35*	.12	.14	.19	.24	-.13
		F	-.43*	-.21	-.10	.00	-.04	-.07	-.12	-.06	-.20	-.25	-.18	-.35*
65	ULIP	M	.19	.00	-.02	.17	.21	.26	.22	.23	.21	.16	.21	.16
		F	-.17	-.01	-.06	-.11	-.08	-.21	-.19	.06	-.12	-.11	-.27	-.41*
66	LLIP	M	.10	.00	-.01	.00	.03	.33*	.37*	.01	.27	-.03	-.02	-.15
		F	-.43**	.10	.26	.25	.28	.46**	.39*	.28	.31	.29	-.01	-.07

Table 15C(iii) Correlation coefficients for angular soft tissue pre- and post-treatment differences and vertical hard tissue pre- and post-treatment differences in males and females.

		49	50	51	52	53	54	55	56	57	58	
		MD-SN	PA-SN	U1-SN	LI-MD	U1-L1	OC-SN	SNA	SNB	ANB	NAP	
59	SNSAS	M	-.28	-.20	.33	-.03	-.17	-.40*	.56**	.45**	.46**	.51**
		F	.16	-.04	.41*	-.22	-.35*	-.22	.09	-.11	.14	.18
60	SNSBS	M	-.11	-.15	.43**	.34*	-.53**	-.46**	.31	.28	.23	.27
		F	-.17	-.10	.05	-.08	-.01	-.08	.24	.50**	-.05	.07
61	ASNBS	M	-.01	-.27	.24	-.08	-.11	-.29	.49**	.10	.54**	.53**
		F	.29	.04	.36*	-.16	-.35*	-.16	-.10	-.50**	.18	.12
62	CON	M	-.27	.00	.03	.02	-.01	-.14	-.21	.11	-.31	-.32
		F	-.59**	.21	.07	-.04	.18	-.28	-.16	.54**	-.44**	-.53*
63	CONN	M	-.39*	-.05	.10	.07	-.07	-.35*	.11	.49**	-.11	-.17
		F	-.61**	.01	.21	-.12	.13	-.44**	-.13	.66**	-.48**	-.47**
64	NASO	M	.30	.13	-.16	-.08	.13	.38*	-.69**	-.34*	-.66**	-.64**
		F	.33*	.14	-.48**	.01	.35*	-.48**	-.06	-.41*	.17	.10
65	ULIP	M	-.02	-.04	.01	.09	-.07	.17	-.43**	.03	-.54**	-.49**
		F	.36*	.01	.12	-.18	-.25	.02	-.01	-.35*	.18	.18
66	LLIP	M	.17	.22	-.03	.19	-.13	.16	-.35*	-.23	-.31	-.32*
		F	.23	.00	-.56**	.26	.21	.28	.22	.11	.14	.29

Table 15C(iv) Correlation coefficients for angular soft tissue pre- and post-treatment differences and dentoskeletal angular pre- and post-treatment differences in males and females.

			12 N	13 A	14 RS	15 PR	16 IES	17 IEI	18 PRI	19 RI	20 B	21 P	22 GN	25 GO
12	N	M		-.10	-.18	-.18	-.24	-.16	-.04	.09	.13	.17	.10	.10
		F		.19	.17	.14	.03	.06	.31*	.35*	.16	.25	.24	.36*
13	A	M			.87**	.88**	.70**	.72**	.72**	.58**	.66**	.64**	.67**	-.47**
		F			.69**	.74**	.08	.17	.14	.18	.09	-.01	-.03	-.02
14	RS	M				.80**	.53**	.63**	.66**	.52**	.56**	.53**	.57**	-.39*
		F				.57**	-.25	.03	.01	-.08	-.10	-.21	-.18	.19
15	PR	M					.90**	.84**	.88**	.72**	.69**	.65**	.68**	-.59**
		F					.52**	.24	.34	.41*	.14	.12	.11	-.08
16	IES	M						.82**	.83**	.68**	.66**	.58**	.61**	-.65**
		F						.18	.25	.42*	.22	.28	.26	-.22
17	IEI	M							.83**	.48**	.62**	.51**	.54**	-.54**
		F							.69**	.16	.22	.13	.16	.08
18	PRI	M								.80**	.83**	.79**	.76**	-.68**
		F								.67**	.57**	.52**	.52**	-.21
19	RI	M									.75**	.73**	.68**	-.53**
		F									.65**	.64**	.62**	-.29
20	B	M										.96**	.95**	-.70**
		F										.90**	.88**	-.52**
21	P	M											.97**	-.69**
		F											.99**	-.59**
22	GN	M												-.68**
		F												-.61**

Table 15D(i) Correlation coefficients for the differences between horizontal hard tissue variables measured pre- and post-treatment in males and females. (variables 23, MS and 24, MI have been excluded from this table).

			37 N	38 ANS	39 A	40 PR	41 IES	42 IEI	43 PRI	44 B	45 P	46 GN	47 MS	48 GO
37	N	M		.43**	.35*	.37*	.47**	.48**	.48**	.24	.21	.25	-.22	.00
		F		.23	.12	.31*	.21	.05	.18	.06	.22	.29	.44**	.34*
38	ANS	M			.73**	.72**	.63**	.55**	.59**	.41*	.50**	.64**	.31*	.41*
		F			.57**	.54**	.51**	.39*	.54**	.50**	.61**	.53**	.58**	.38*
39	A	M				.67**	.45**	.46**	.45**	.28	.52**	.68**	.40*	.42*
		F				.67**	.60**	.45**	.50**	.45**	.76**	.66**	.23	.23
40	PR	M					.87**	.71**	.63**	.42*	.47**	.71**	.38*	.21
		F					.92**	.60**	.66**	.72**	.84**	.82**	.37*	.34*
41	IES	M						.73**	.74**	.52**	.35*	.61**	.17	.04
		F						.67**	.69**	.80**	.79**	.80**	.27	.32*
42	IEI	M							.90**	.62**	.51**	.64**	.29	.16
		F							.90**	.73**	.59**	.66**	.16	.16
43	PRI	M								.65**	.53**	.68**	.29	.23
		F								.72**	.64**	.71**	.41*	.32*
44	B	M									.51**	.60**	.29	.33*
		F									.74**	.79**	.22	.15
45	P	M										.81**	.48**	.43**
		F										.93**	.43**	.48**
46	GN	M											.62**	.56**
		F											.39*	.50**
47	MS	M												.64**
		F												.48**

Table 15D(ii) Correlation coefficients for vertical hard tissue pre- and post-treatment differences in males and females.

			12	13	14	15	16	17	18	19	20	21	22	23	24	25
			N	A	RS	PR	IES	IEI	PRI	RI	B	P	GN	MS	MI	GO
37	N	M	-.02 .37*	.03 .15	.11 .11	-.15 .39*	-.25 .41*	.00 .16	-.19 .29	-.33* .30	-.11 .27	-.20 .38*	-.14 .39*	-.21 .16	-.01 .09	.26 -.10
38	ANS	M	.40*	.03	-.03	-.18	-.29	-.16	-.21	-.20	-.11	-.10	-.09	-.12	-.02	.47**
		F	.42*	.08	-.08	.14	.26	.10	-.03	.10	-.03	.08	.09	.05	-.01	.20
39	A	M	.33*	-.09	-.23	-.29	-.25	-.20	-.21	-.23	-.15	-.16	-.17	.12	.07	.43**
		F	.66**	.21	.06	.08	.01	-.02	.10	.26	.05	.05	.07	-.10	-.15	.35*
40	PR	M	.53**	-.36*	-.32*	-.52**	-.63**	-.44**	-.44**	-.35*	-.47**	-.43**	-.46**	.06	-.05	.67**
		F	.69**	.26	.36*	.22	-.17	.10	.18	.14	-.09	.01	.02	-.01	.04	.44**
41	IES	M	.38*	-.40*	-.30	-.57**	-.67**	-.46**	-.54**	-.40*	-.50**	-.48**	-.52**	-.15	-.14	.73**
		F	.70**	.27	.41*	.24	-.14	.25	.25	-.12	-.11	-.05	-.03	.12	.07	.45**
42	IEI	M	.24	-.31*	-.28	-.49**	-.57**	-.21	-.44**	-.63**	-.44**	-.44**	-.41*	-.14	.03	.64**
		F	.43**	.03	-.02	-.13	-.26	.46**	.18	-.11	-.11	-.12	-.10	-.24	.09	.45**
43	PRI	M	.33*	-.27	-.26	-.53**	-.59**	-.30	-.50**	-.56**	-.31*	-.32*	-.29	-.10	.07	.58*
		F	.49**	.10	.05	-.01	-.13	.34*	.05	-.01	-.04	-.01	.03	-.02	.18	.46**
44	B	M	.09	-.06	.05	-.25	-.41*	-.18	-.11	-.17	-.08	-.04	-.05	.02	.06	.48**
		F	.49**	.17	.18	.12	-.08	.22	.11	.00	-.36*	-.30	-.28	-.27	.07	.49**
45	P	M	.24	-.06	-.21	-.20	-.21	-.23	-.14	-.13	-.08	-.07	.00	-.03	-.03	.37*
		F	.68**	.14	.15	.18	.01	.07	.26	.34*	.04	.06	.07	-.12	.09	.37*

(continued next page)

Table 15D(iii) Correlation coefficients for vertical hard tissue pre- and post-treatment differences and horizontal hard tissue pre- and post-treatment differences in males and females.

			12	13	14	15	16	17	18	19	20	21	22	23	24	25
			N	A	RS	PR	IES	IEI	PRI	RI	B	P	GN	MS	MI	GO
46	GN	M	.52**	-.21	-.34*	-.40*	-.43**	-.37*	-.23	-.17	-.12	-.08	-.13	.10	.11	.51**
		F	.68**	.17	.10	.24	.10	.18	.34*	.38*	.09	.13	.11	-.18	.13	.38*
47	MS	M	.50**	-.21	-.37*	-.26	-.20	-.19	.02	.04	.14	.18	.12	.44**	.37*	.04
		F	.35*	.01	.12	.18	.15	-.09	.01	.15	.23	.34*	.37*	.40*	.24	-.01
48	GO	M	.47**	-.24	.05	.12	.07	.11	.36	.21	.53**	.59**	.54**	.51**	.57**	-.22
		F	.27	.07	-.02	.33*	.33*	.23	.52**	.68**	.67**	.72**	.75**	.26	.39*	-.37*

Table 15D(iii) continued

SECTION 3

APPENDIX 16**CASE ANALYSES**

5 selected cases from the sample

Each case includes:

- a case description
- superimposed tracings (method in chapter 2.4), figure (i)
- profile photographs taken before and after treatment (not standardised), figure (ii)
- graphs of Z-scores for 17 selected variables (abbreviations listed in appendix 8), figure (iii)

Pre-treatment Z-scores, dotted line

Pre-treatment/post-treatment differences Z-scores, solid line

A. CASE 1

Subject 50, female
Class 2, division I malocclusion

Age pre-treatment : 12.9 yrs (-0.6 standard deviations from \bar{x})

Age post-treatment : 14.8 yrs
Difference between post- and pre-treatment
ages -0.2 standard deviations from \bar{x}

The hand-wrist radiograph indicated that the skeletal age was approximately 12 yrs. pre-treatment (Greulich and Pyle, 1966) and according to Grave and Brown (1976) (figure 13) this corresponded to peak growth velocity.

Treatment : Non-extraction

Lip posture : Slight interlabial gap before and after treatment. Lips relaxed post-treatment.

Z-scores : All scores in figure (iii) within 2 standard deviations from the \bar{x} .
Incisor retraction very close to the \bar{x} .
(except B point).
Lower incisor proclination was close to the \bar{x} .
H ST variables were all within 1 standard deviations of \bar{x} .

Discussion : The soft tissue profile response in figure (i) shows a downward and forward growth pattern. The lips showed retraction and reduced concavities. The mandibular plane rotated downwards and backwards.

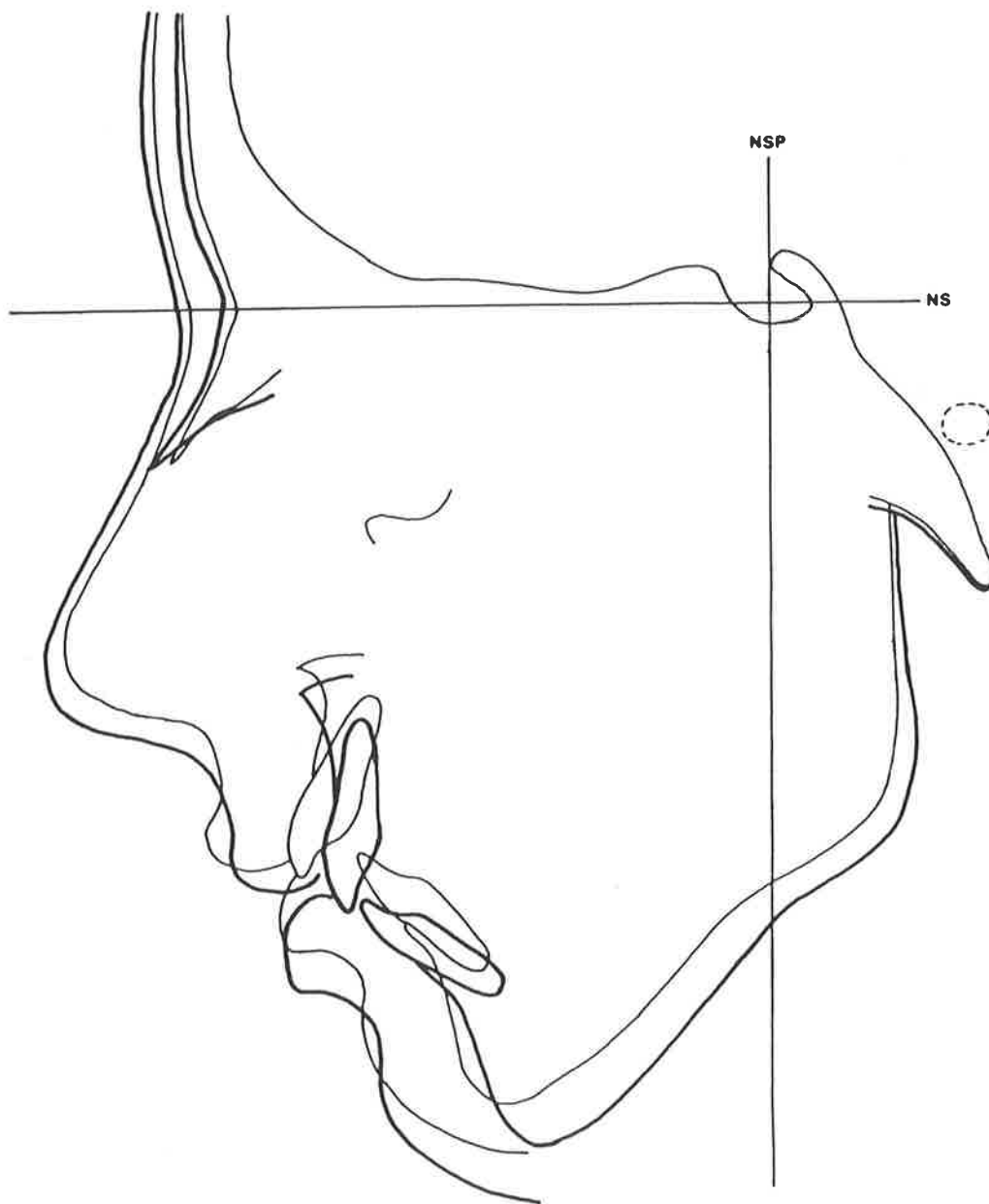


Figure b(i) Superimposed tracings of case 1

— pre-treatment
— post-treatment



Pre-treatment



Post-treatment

Figure b(ii) Profile photographs of case 1

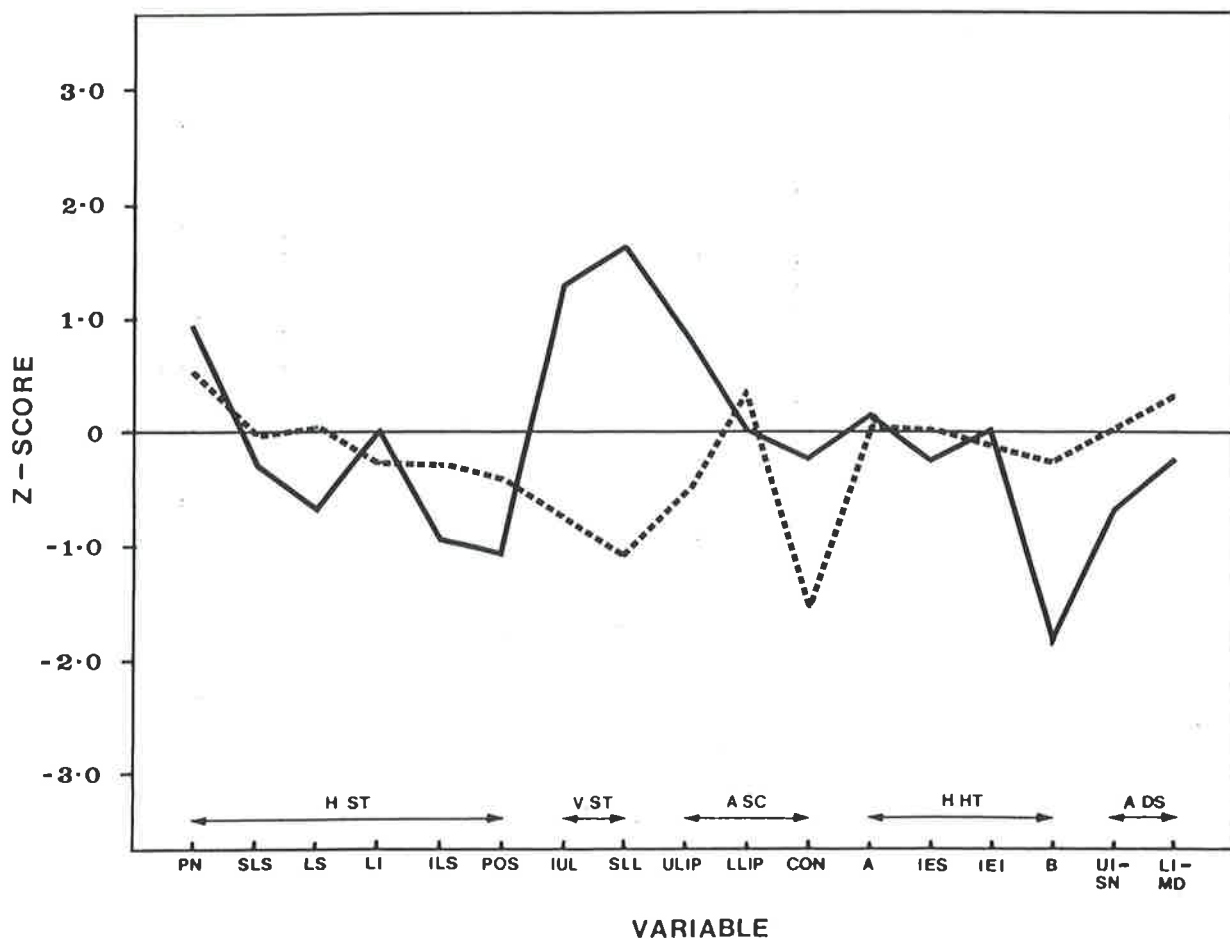


Figure b(iii) Graph of Z-scores for case 1

B. CASE 2

Subject 44, female
Class 2, division 1 malocclusion

Age pre-treatment : 13.9 yrs. (0.1 standard deviations from \bar{x})

Age post-treatment : 16.8 yrs.
Difference between post- and pre-treatment
ages 1.0 standard deviation from \bar{x}

The hand-wrist radiograph indicated that the skeletal age was approximately 13.5 yrs. pre-treatment (Greulich and Pyle, 1966), and according to Grave and Brown (1976) (figure 13) this was well post-peak in relation to the adolescent growth spurt.

Treatment : 4 | 4 and E | E extracted.
65 | 56 were congenitally absent.
7 | 7 were in the position of 6 | 6. Lingual
root torque 21 | 12 and 21 | 12

Lip posture : Slight interlabial gap pre-treatment, closed
without apparent strain post-treatment.

Z-scores : Compared to the \bar{x} values there was:
Greater H ST and H HT values pre-treatment.
Less incisor and lip retraction.
More chin and nose growth.
Less lower incisor proclination.
Upper lip flattened less, and lower lip more.
Profile convexity (excluding the nose)
increased more.

Discussion : The profile changes seen in figure (i) show
significant forward growth of the bony chin
which was followed in about a 1:1
relationship by the soft tissue chin.
Significant forward nose growth also
occurred. As a result the profile "dished-in"
after treatment even though the lip response
was less than the mean. The lower incisors
were uprighted (retroclined after stage 2 and
lingual root torque was applied in stage 3).
Had the lower incisors been kept forward
(proclined - as in many other cases and
according to the mean) a better lower lip
support way have been provided. However, the
long term stability of the lower incisor
segment may also have been compromised.

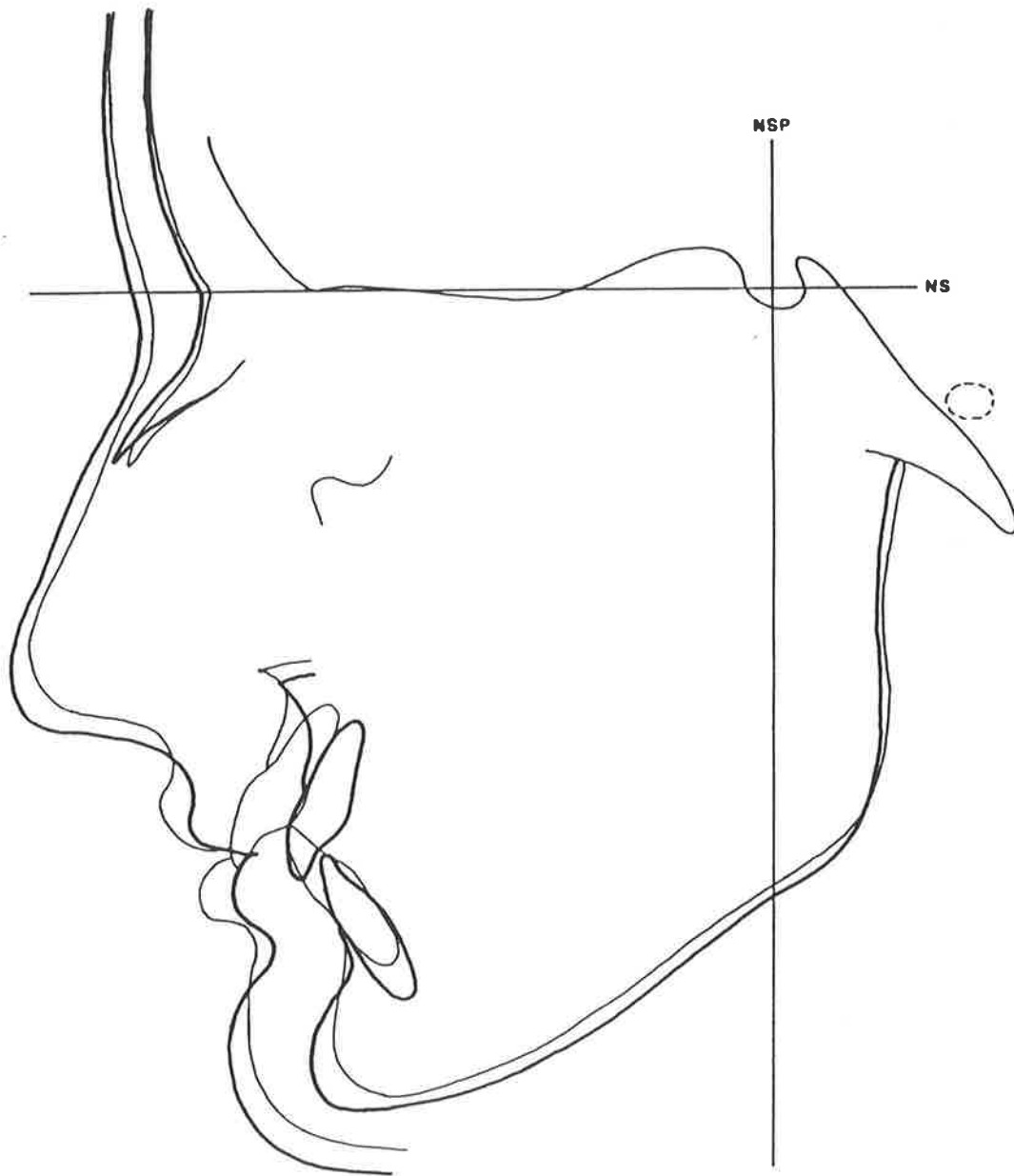


Figure c(i) Superimposed tracings of case 2

————— pre-treatment
————— post-treatment



Pre-treatment



Post-treatment

Figure c(ii) Profile photographs of case 2

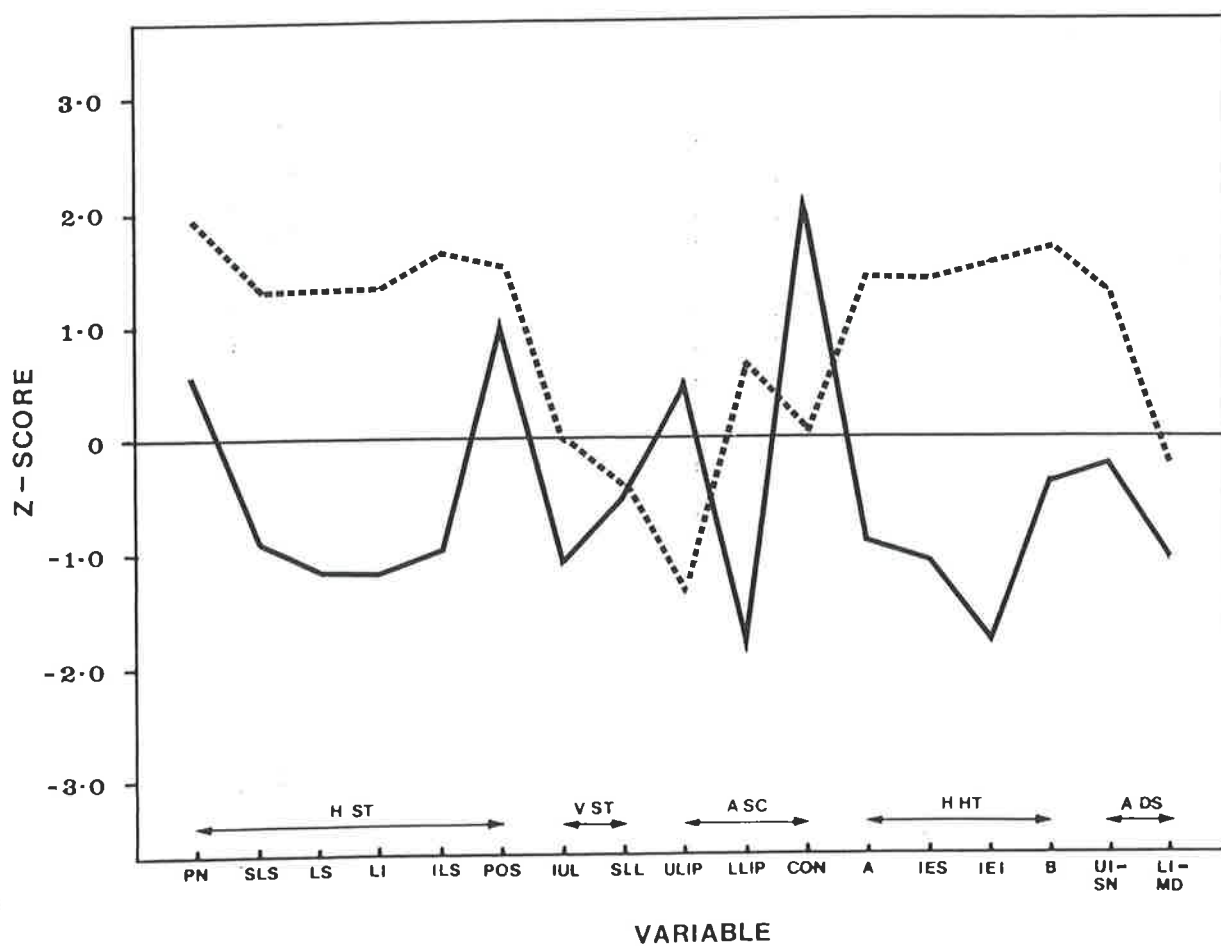


Figure c(iii) Graph of Z-scores for case 2

C. CASE 3

Subject 41, female
Class 2, division 1 malocclusion

Age pre-treatment : 15.3 yrs. (1.1 standard deviations from \bar{x})

Age post-treatment : 16.8 yrs.
Difference between post- and pre-treatment
ages -0.64 standard deviations from \bar{x}

The hand-wrist radiograph indicated that the skeletal age was approximately 15.5 yrs. pre-treatment (Greulich and Pyle, 1966) and according to Grove and Brown (1976) (figure 13) very little growth potential remained.

Treatment : 6 | 4 extracted

Lip posture : Small interlabial gap pre-treatment, curled lower lip. Closed without apparent strain post-treatment.

Z-scores : Mainly close to the \bar{x} .
More retraction if IES than \bar{x} , retraction of LS close to \bar{x} .
Lower incisors more upright than \bar{x} before treatment and also proclined more due to treatment.

Discussion : Minimal nose change occurred since the patient was essentially non-growing. Mandibular rotation occurred and the soft tissue chin followed. Both lips reduced in concavity. Although the upper lip seemed to follow the upper incisor less than average, this could also largely be due to lip posture.

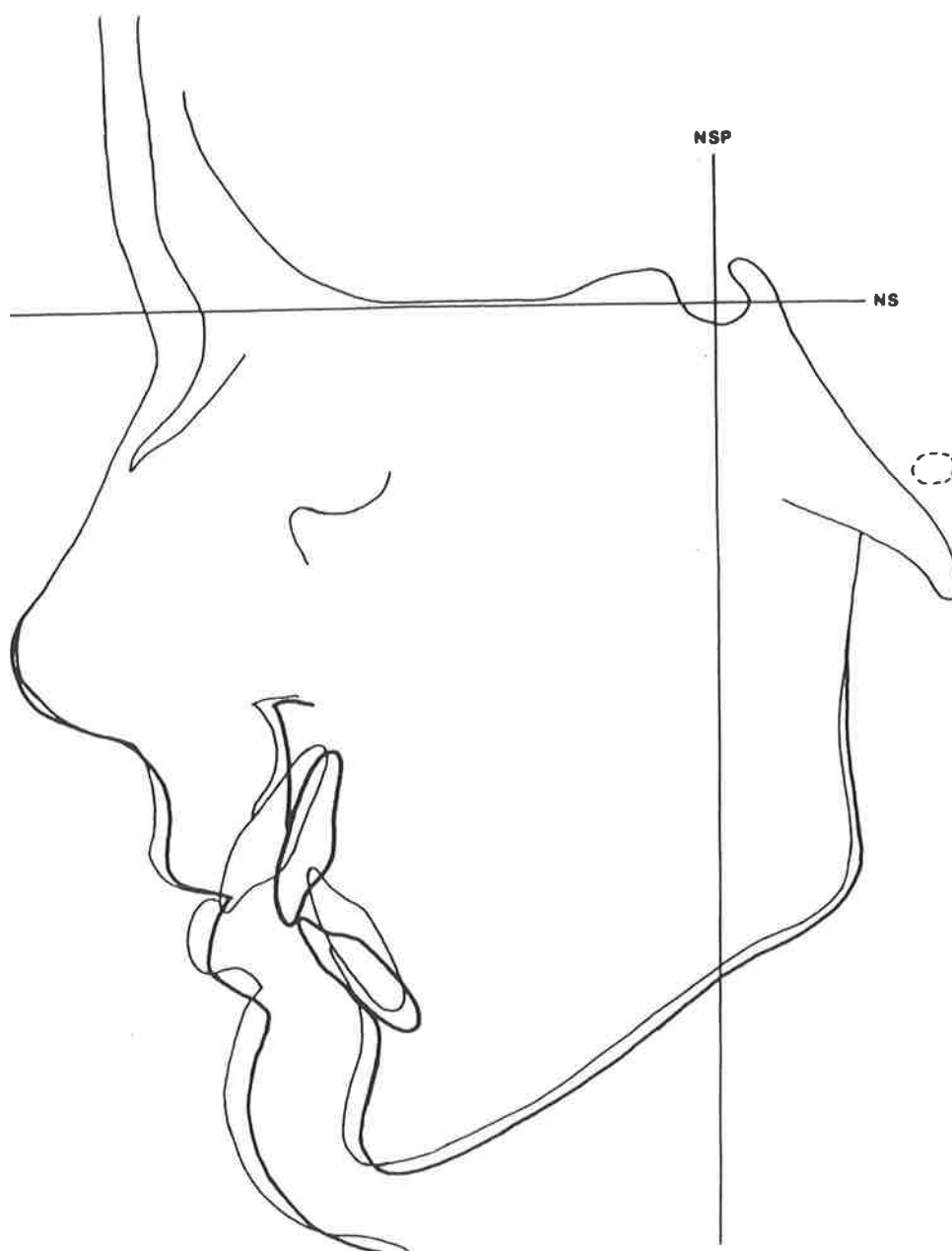


Figure d(i) Superimposed tracings of case 3

— pre-treatment
— post-treatment



Pre-treatment



Post-treatment

Figure d(ii) Profile photographs of case 3

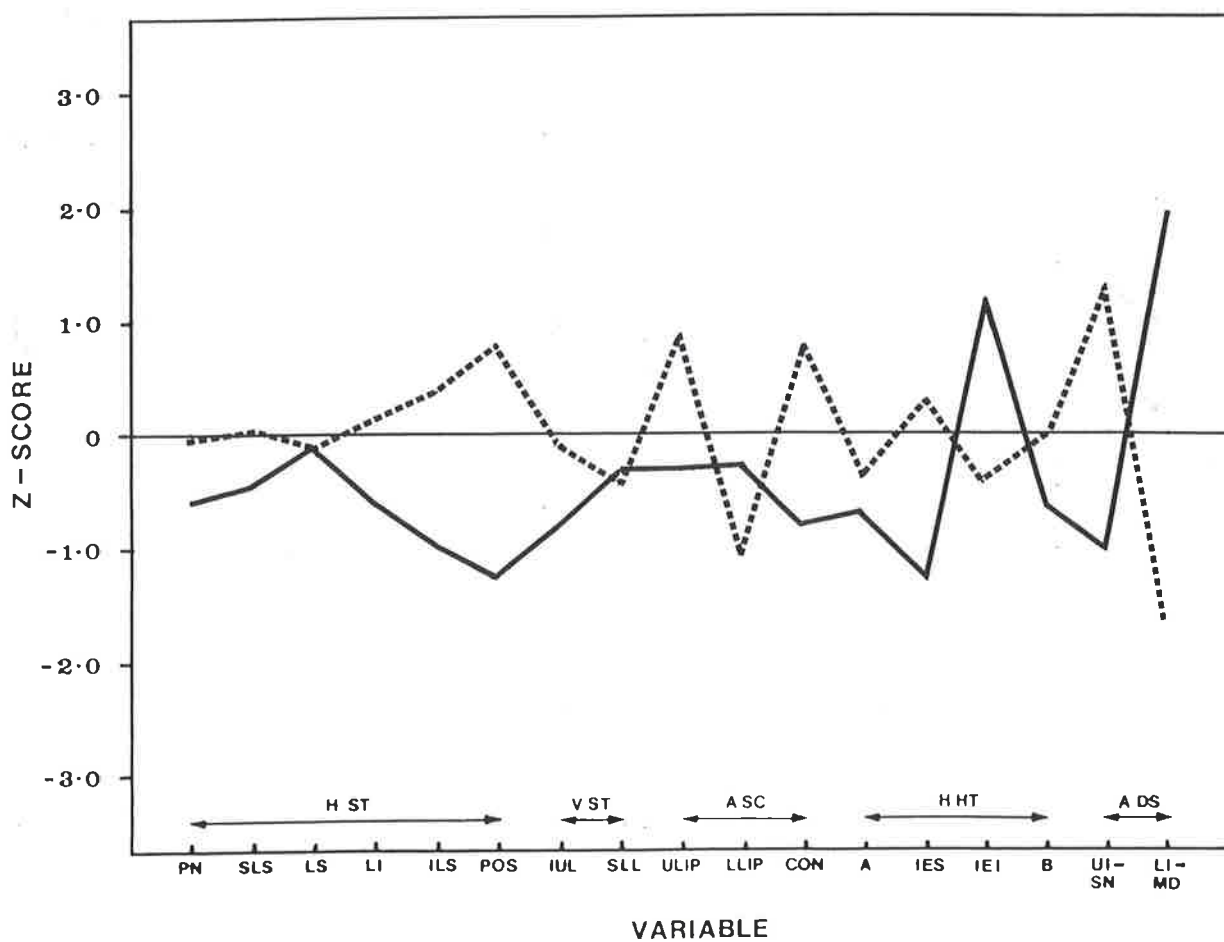


Figure d(iii) Graph of Z-scores for case 3

D. CASE 4

Subject 14, male
Class 1 molars and proclined incisors

Age pre-treatment : 12.4 yrs. (-0.9 standard deviations from \bar{x})

Age post-treatment : 14.8 yrs.
Difference between post- and pre-treatment
ages 0.9 standard deviations from \bar{x}

The hand-wrist radiograph indicated that the skeletal age was approximately 11.5 yrs. which was about 1 year less than the chronological age pre-treatment (Greulich and Pyle, 1966). According to Grave and Brown (1976) (figure 13), this was well pre-peak in relation to the adolescent growth spurt.

Treatment : Four first premolars extracted.

Lip posture : Interlabial gap, relaxed before and after treatment.

Z-scores : H ST and H HT scores close to means before treatment. H ST response greater than \bar{x} values. Flatter lower lip before treatment, less flattening after treatment.

Discussion : Significant growth occurred as evident in the large space between the soft tissue profiles in figure (i). The chin grew downwards and forwards. The large fleshy lips tended not to follow the incisor retraction and they showed a net forward movement post-treatment.

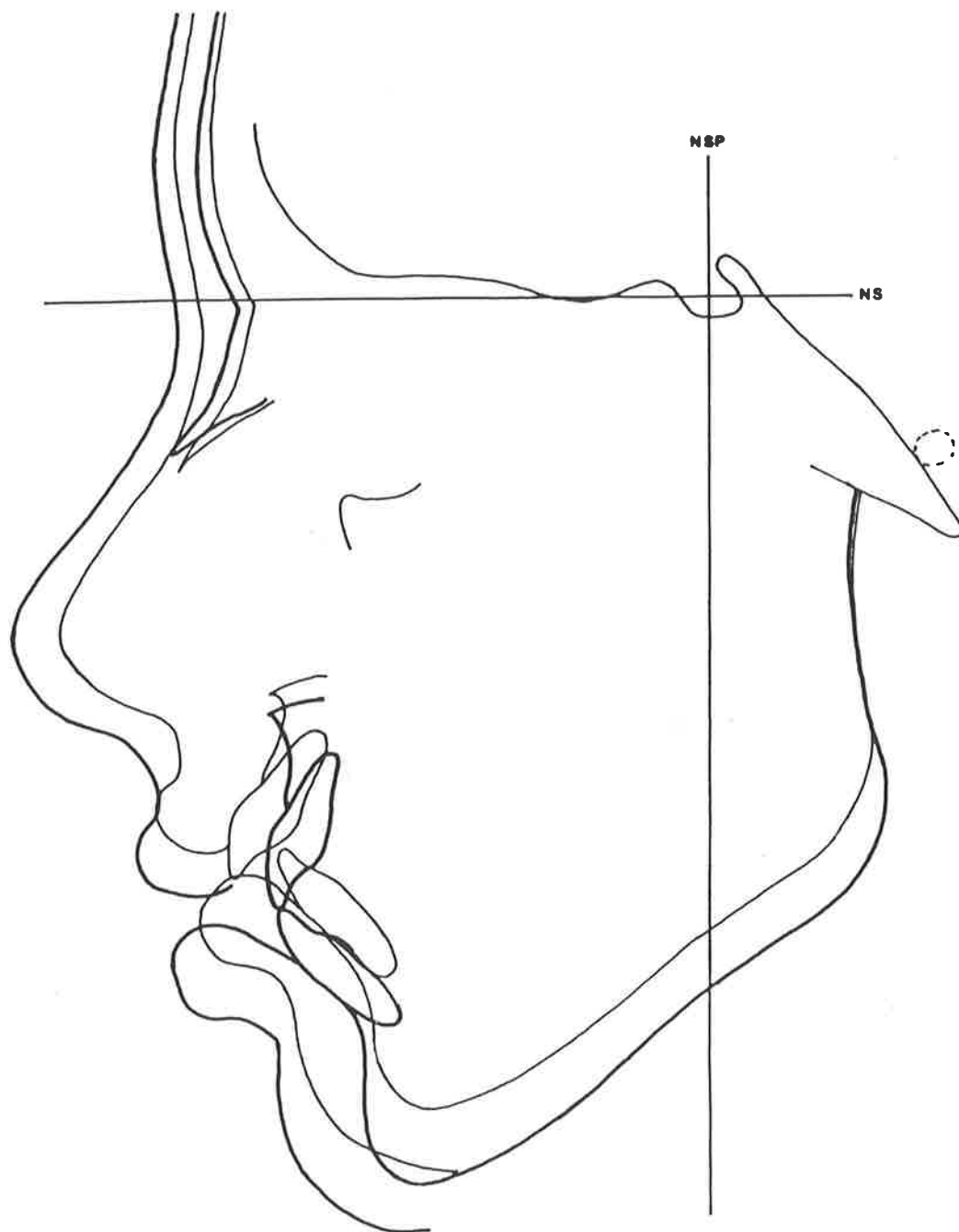


Figure e(i) Superimposed tracings of case 4

———— pre-treatment
———— post-treatment



Pre-treatment



Post-treatment

Figure e(ii) Profile photographs of case 4

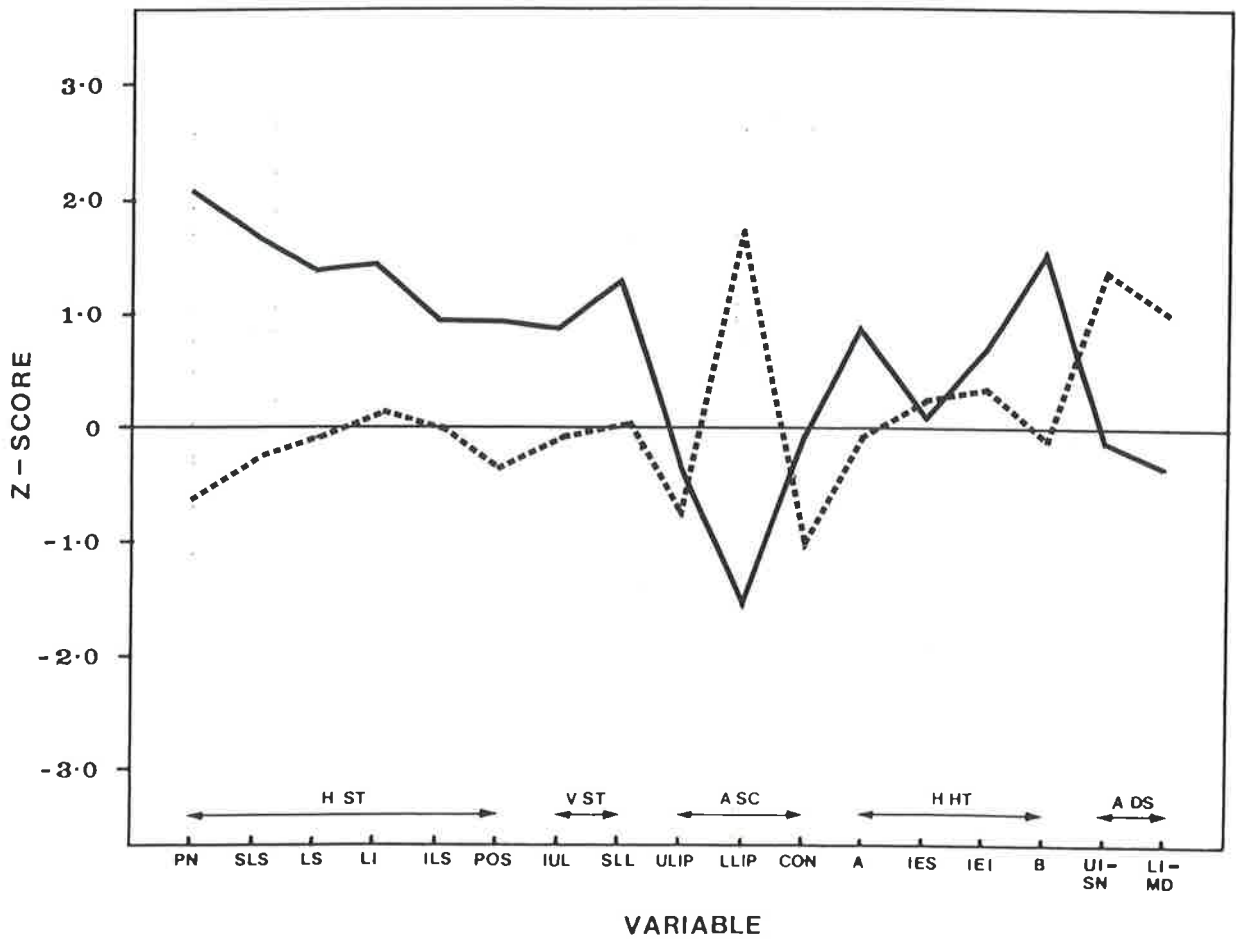


Figure e(iii) Graph of Z-scores for case 4

E. CASE 5

Subject 15, male
Class 1, bimaxillary prognathism

Age pre-treatment : 14.3 yrs. (0.5 standard deviations from \bar{x})

Age post-treatment : 16.8 yrs.

Difference between post- and pre-treatment ages 1.06 standard deviations from \bar{x}

The hand-wrist radiograph indicated that the skeletal age was approximately 12.5 yrs, which was more than 1.5 yrs. less than the chronological age pre-treatment (Greulich and Pyle, 1966). According to Grave and Brown (1976) (figure 13) this indicated that this subject was pre-peak in relation to the adolescent growth spurt.

Treatment : Four first premolars extracted.

Lip posture : Extreme interlabial gap before treatment. Large interlabial gap after treatment. Relaxed posture.

Z-scores : Pre-treatment the scores for V ST IUL and V ST SLL confirmed the incompetent lip pattern (see also figure 2). During treatment the upper lip moved vertically 2 standard deviations more than average, while the lower lip showed less than average vertical change. The lower incisors retracted and proclined less than the \bar{x} .

Discussion : Figure (i) shows that a significant amount of growth occurred. The upper lip showed little tendency to follow the upper incisor retraction. Both lips seemed to "thicken" with treatment.

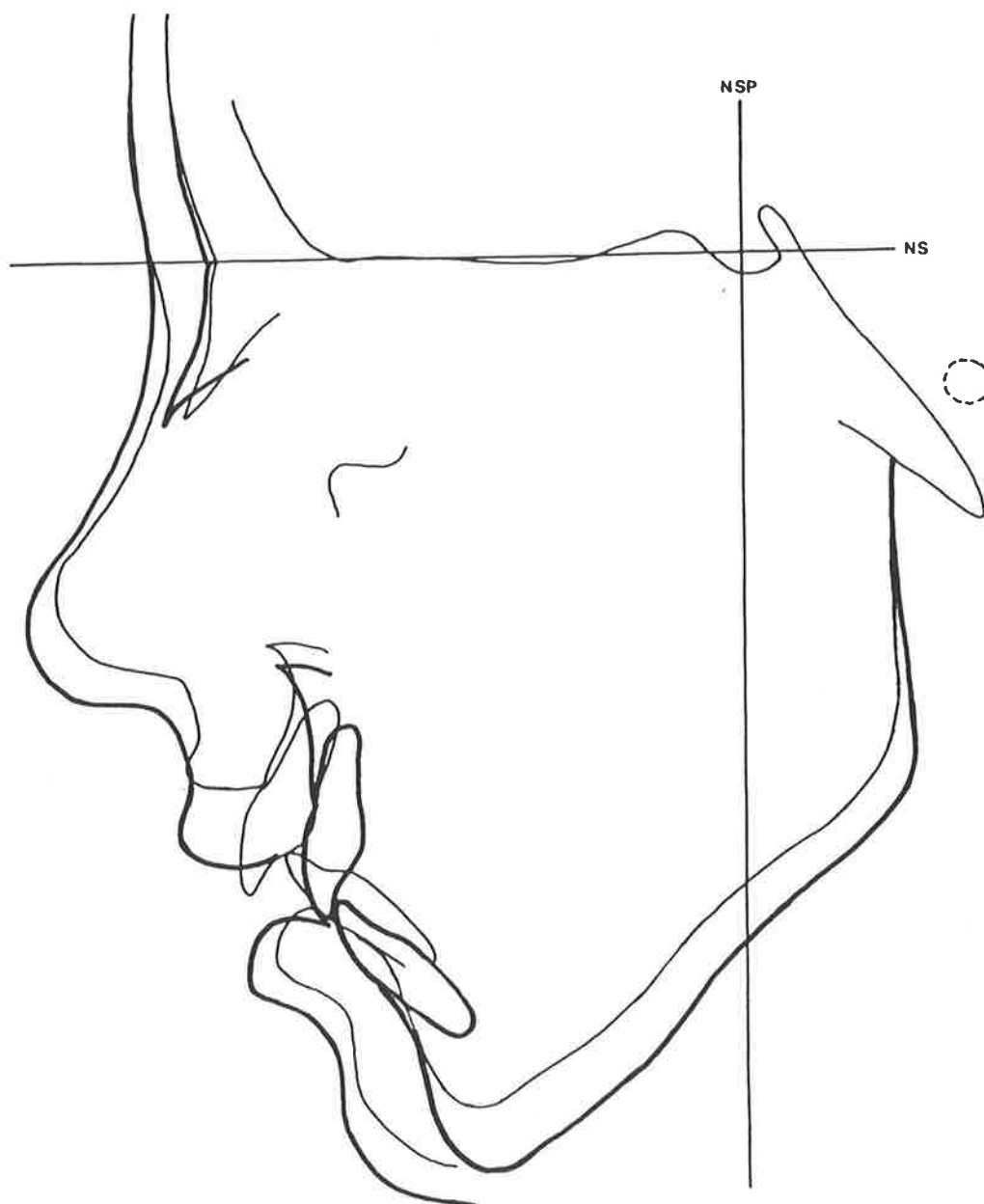


Figure f(i) Superimposed tracings of case 5

———— pre-treatment
———— post-treatment



Pre-treatment



Post-treatment

Figure f(ii) Profile photographs of case 5

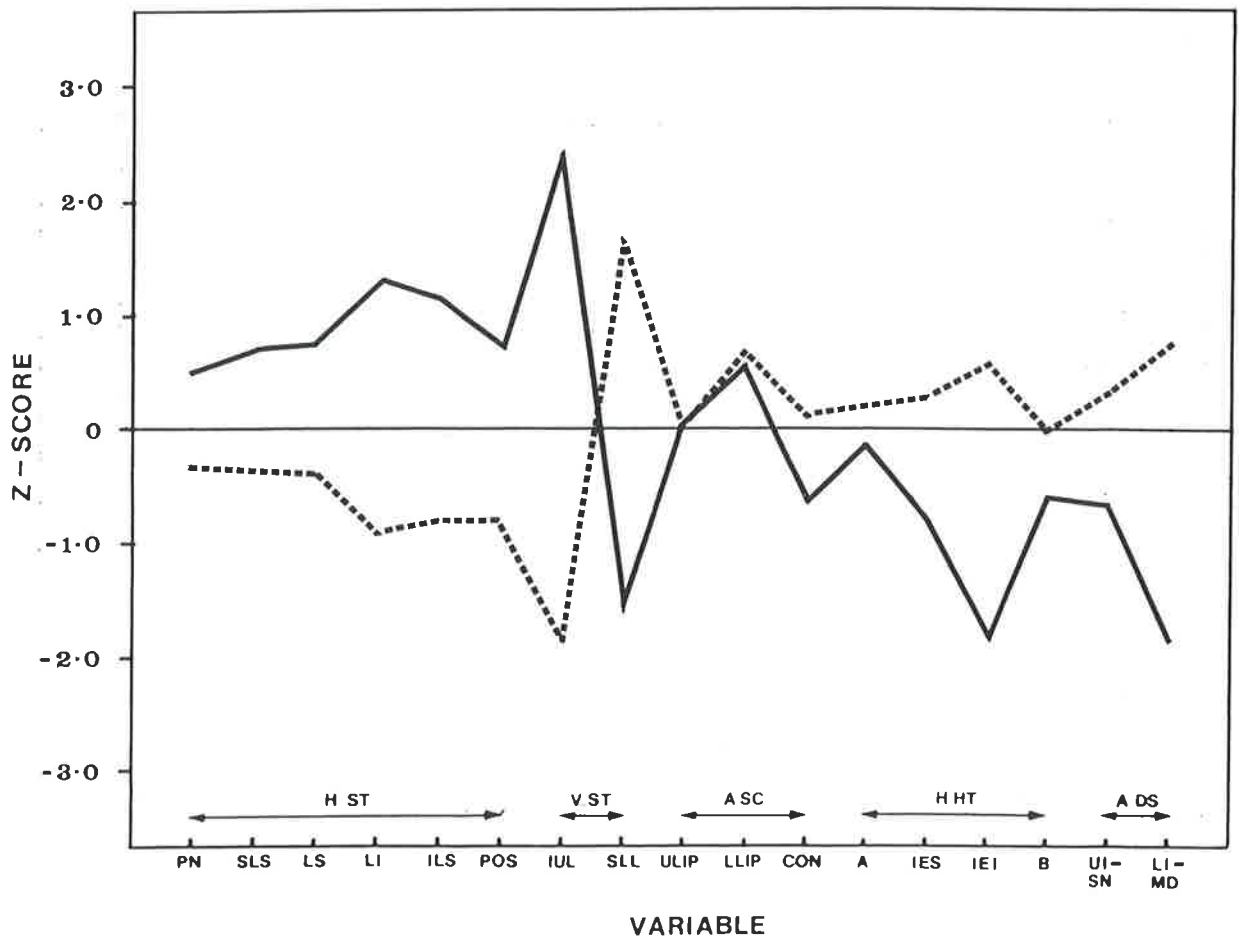


Figure f(iii) Graph of Z-scores for case 5

ERRATA

PAGE 23: SECTION 5.

The first line should read:

'The other points listed in Figure A, Page 11 were then identified and....'

PAGE 125:

LINE 12:

'4 | 4 and E | E extracted' should read:

'4 | 4 and E | E extracted. 6 | 6 previously extracted.'

LINE 13:

'65 | 56 were congenitally absent' should read:

'5 | 5 were congenitally absent'.