

ORIGINAL RESEARCH

A Cephalometric Study of Facial Profile Changes of Gujaratis From Young to Adulthood (8-18Years)

Nipa Chauhan¹, A. F. Bhatia², Dhaval Somani³, Tilak Parikh⁴, Krishna Ranpura⁵, Sejal Patel⁶

ABSTRACT

Objective: The objective of this study was to understand and compare the hard and soft tissue morphology of dentofacial skeleton in young and adult Gujarati girls and boys, having normal occlusion and pleasing profile.

Materials and Methods: Cephalograms of 20 subjects from Gujarati community, which were not treated orthodontically, with Class I dentoskeletal relationships, were obtained between the ages of 8 and 18 years.

Results: Hard tissue measurements: SNB, SL, and ANB are significantly increased in group of boys and girls from young to adult. Angle of convexity is significantly decreased in both boys and girls with increase in age. SND and Down's Y-axis are significantly decreased in girls with increase in age. In adult group of boys and girls, Go-Gn to SN and Down's Y-axis are significantly increased, and Jarabak ratio, IMPA, and L1 to NB are significantly decreased. Soft tissue measurements: Nasolabial angle is significantly less in boys than girls of same age group (8–10 years). Chin thickness is significantly increased in adult boys than adult girls. S line to upper lip and lower lip are significantly decreased in both groups. H line angle is significantly decreased in adult boys than young boys.

Conclusion: The current findings identify areas of growth and changes in individuals during this period and should be considered during treatment planning of orthodontic and orthognathic patients.

Keywords: Cephalometry, Facial growth, Soft tissue profile

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INTRODUCTION

The fact highlighted as early as 1834 reveals that the position of teeth and supporting jaws has a significant effect on an individual's facial appearance. It is also well known that the teeth and supporting jaws undergo great variation in their size and position during the growing phase, particularly between the age of 8 and 18 years which have great influence on individual's facial form and acceptance.^[1] Any kind of abnormality in the form of any part of dentofacial skeleton will have adverse effect on facial esthetics of an individual.^[4] Different areas of the dentofacial skeleton show either variation or remain constant in their relative position to one another with increase in age.^[9] All above may be desirable or undesirable for future appearance of individuals. Any kind of undesirable changes adversely affecting the facial esthetics of an individual, if recognized, diagnosed, and corrected at the earlier stage is beneficial to the person.

Aim

Early diagnosis of varying areas of the dentofacial skeleton between the age of 8–10 years and 16–18 years in Gujarati children for their timely management to give the individual better esthetics.

Objectives

The objectives of this study were as follows:

- To understand the hard and soft tissue morphology of dentofacial skeleton and soft tissue covering face in young and adult Gujarati girls, having normal occlusion and pleasing profile.
- To understand the hard and soft tissue morphology of dentofacial skeleton and soft tissue covering face in young and adult Gujarati boys, having normal occlusion and pleasing profile.
- To compare the hard and soft tissue morphology of dentofacial skeleton and soft tissue covering face of young Gujarati girls with young Gujarati boys, having normal occlusion and pleasing profile.
- To understand the hard and soft tissue morphology of dentofacial skeleton and soft tissue covering face of adult Gujarati boys with adult Gujarati girls, having normal occlusion and pleasing profile.

MATERIALS AND METHODS

Total sample of 20 subjects is to be divided into four groups as per age and sex of an individual as shown below:

- Young girls (8–10 years)
- Young boys (8–10 years)
- Adult girls (16–18 years)
- Adult boys (16–18 years)

Selection Criteria

- Each subject must clinically have normal occlusion, by a panel of three orthodontists.
- Each subject's facial profile must be graded as normal, by a panel of three orthodontists.
- Absence of supernumerary/supplementary tooth.
- The permanent central incisors and the first molar must be clinically fully erupted in oral cavity in younger age group.
- The permanent teeth up to the second molar must be clinically fully erupted in oral cavity in adult age.
- No history of trauma or injury to the facial structures.
- No previous history of orthodontic treatment taken for any reason.
- No history of any kind of orofacial habits, affecting dentofacial structures.
- In both the groups, no disturbances found in the movement of jaws during various functional activities.
- No obvious systemic problems associated with generalized growth and development of child was observed.
- The subjects selected for study, his/her parents and grandparents must be domicile of Gujarat and Gujarati community.

Method of Obtaining Data

- High contrast and clear digital cephalograms of all samples were taken with above machine giving true size image, which is installed in the department of oral diagnosis, oral medicine and radiology department of our institution.

- The tracings were done on acetate sheets with extra smooth finish HB pencil with lead of 0.3 mm diameter and angular and linear measurements were taken to the nearest 0.50 or 0.5 mm respectively.
- A single operator had performed the tracings in a standardized manner to avoid errors due to inter-operator variations.



Lateral Cephalogram of Gujarati Subject

Class I molar relationship on both sides, with normal overjet and overbite with no or minimal crowding or spacing.



RESULTS

Hard Tissue Measurements

SNB, SL, and ANB are significantly increased in group of boys and girls from young to adult. Angle of convexity is significantly decreased in both boys and girls with increase in age. SND and Down's Y-axis are significantly decreased in girls with increase in age. In adult group of boys and girls, Go-Gn to SN and Down's Y-axis are significantly increased, and Jarabak ratio, IMPA, and L1 to NB are significantly decreased.

Soft Tissue Measurements

Nasolabial angle is significantly less in boys than girls of same age group (8–10 years). Chin thickness is significantly increased in adult boys than adult girls. S line to upper lip and lower lip are significantly decreased in both groups. H line angle is significantly decreased in adult boys than young boys [Tables 1-10].

Table 1

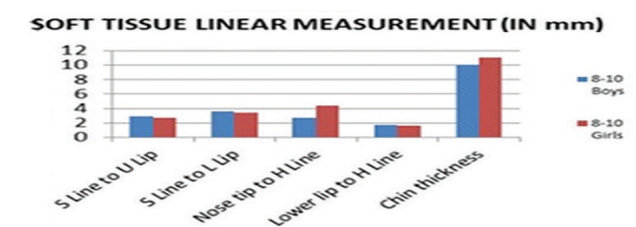
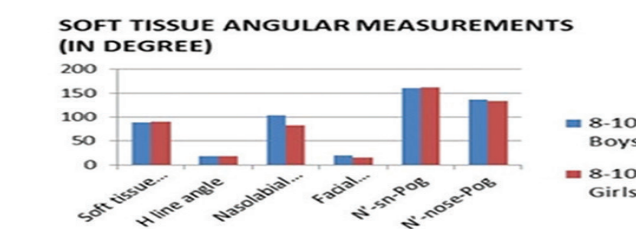
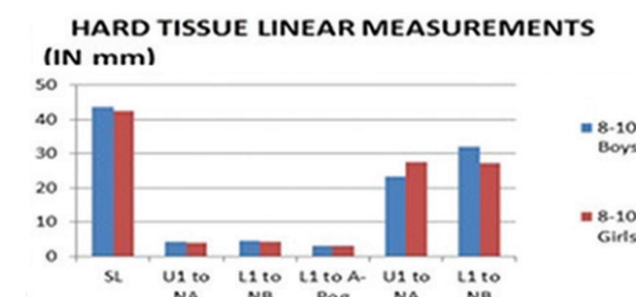
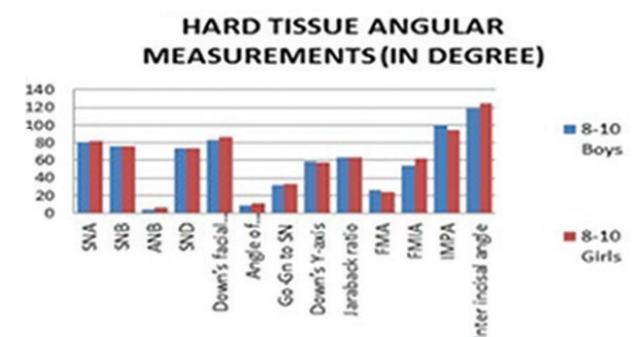
Mean values			
Hard Tissue Angular Measurements (In Degrees)			
		8-10 Boys	8-10 Girls
1	SNA	80.4	81.4
2	SNB	75.8	76.6
3	ANB	4.6	6.6
4	SND	73.2	73.4
5	Down's facial angle	83.2	86.4
6	Angle of convexity	9.2	11.4
7	GoGn-SN	32.6	33.6
8	Down's Y-axis	59	57.4
9	Jaraback ratio	63.20%	63.4%
10	FMA	25.8	24.2
11	FMIA	54	61.6
12	IMPA	100.2	94.2
13	Inter incisal angle	119.2	124.2
Hard Tissue Linear Measurements (In Mm)			
		8-10 Boys	8-10 Girls
14	SL	43.6	42.4
15	U1 to NA	4.4	4
16	L1 to NB	4.6	4.3
17	L1 to A-Pog	3.2	3
18	U1 to NA (In Degree)	23.4	27.6
19	L1 to NB (In Degree)	32.2	27.2

Table 2

Mean values			
Soft Tissue Angular Measurements (In Degrees)			
		8-10 Boys	8-10 Girls
1	Soft tissue facial angle	88.8	90
2	H line angle	18.4	18.2
3	Nasolabial angle	103.2	83.4
4	Facial convexity angle	19.4	14.6
5	N'-Sn-Pog'	160.6	162
6	N'-nose-Pog'	136.6	133.8
Soft Tissue Linear Measurements (In Mm)			
		8-10 Boys	8-10 Girls
7	S line to U lip	2.9	2.7
8	S line to L lip	3.6	3.4
9	Nose tip TO H line	2.7	4.4
10	L lip to H line	1.7	1.6
11	Chin thickness	10	11

DISCUSSION

Soft tissue characteristics have attracted the attention of many scientists and prominent orthodontists. These characteristic can guide tooth placement, occlusal correction and be assessed objectively as one factor that determines the need for orthodontic treatment, substituting some subjective treatment need assessment methods.^[5] Furthermore, they can be a diagnostic feature in some craniofacial anomalies. However, it is



important to have an objective standard as a reference. Peck and Peck used three concepts to discuss facial attractiveness:^[6]

1. Facial symmetry and balance,
2. Facial harmony, and
3. Facial proportions.

The term facial harmony is commonly used to express true beauty in orthodontics. Peck and Peck defined facial harmony as the orderly and pleasing

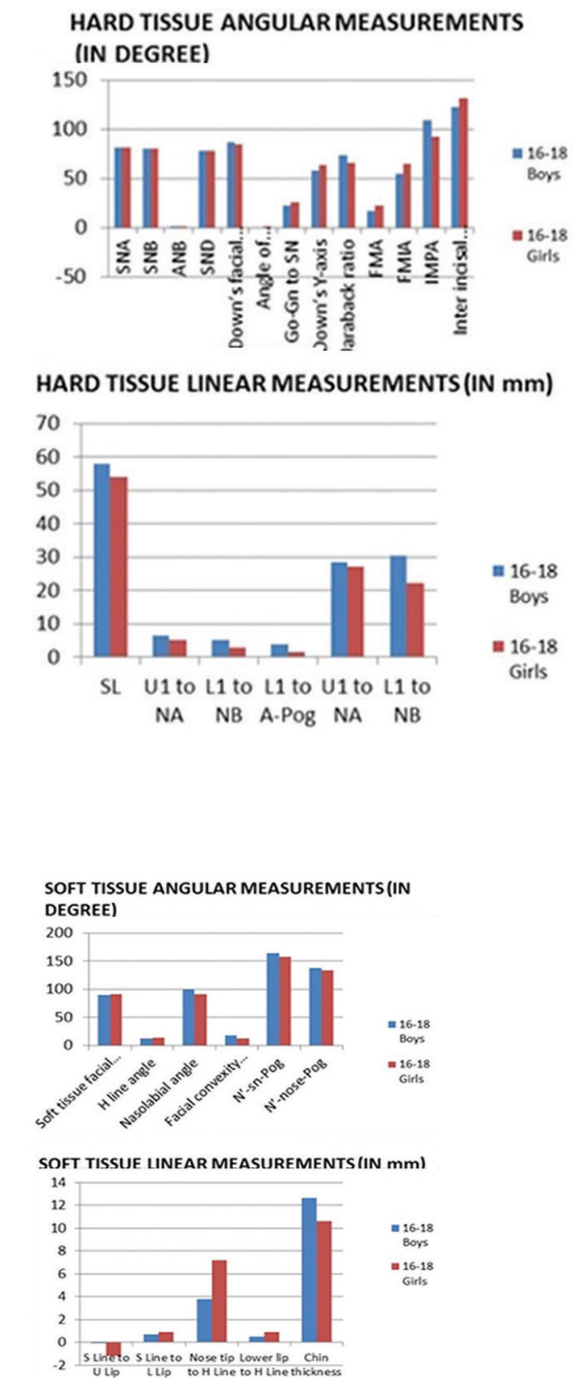
Table 3

Mean values			
Hard Tissue Angular Measurements (In Degrees)			
		16-18 Boys	16-18 Girls
1	SNA	81.3	81.7
2	SNB	79.7	80.5
3	ANB	1.6	1.2
4	SND	77.3	77.9
5	Down's facial angle	86.3	85
6	Angle of convexity	-0.1	0.5
7	GoGn-SN	22	25.9
8	Down'S Y-axis	57.4	63.5
9	Jaraback ratio	73.38	65.94
10	FMA	17.2	22.7
11	FMIA	54.1	64.9
12	IMPA	108.7	92.4
13	Inter incisal angle	122.8	131.4
Hard Tissue Linear Measurements (In Mm)			
		16-18 Boys	16-18 Girls
14	SL	58	53.9
15	U1 to NA	6.4	5.2
16	L1 to NB	5.3	2.7
17	L1 to A-Pog	3.8	1.7
18	U1 to NA (In Degree)	28.3	27
19	L1 to NB (In Degree)	30.5	22.3

Table 4

Mean values			
Soft Tissue Angular Measurements (In Degrees)			
		16-18 Boys	16-18 Girls
1	Soft tissue facial angle	89	90.6
2	H line angle	12.7	13.2
3	Nasolabial angle	98.4	90.9
4	Facial convexity angle	17.4	12.8
5	N'-Sn-Pog'	164.4	158
6	N'-nose-Pog'	137.1	134.2
Soft Tissue Linear Measurements (In Mm)			
		16-18 Boys	16-18 Girls
7	S line to U lip	-0.1	-1.2
8	S line to L lip	0.7	0.9
9	Nose tip TO H line	3.8	7.2
10	L lip to H line	0.5	0.9
11	Chin thickness	12.6	10.6

arrangement of the facial parts in profile.^[6] The harmonious profile flow is described as a series of waves.^[8] Irregularities in the profile flow create attention in that area of the face. Facial proportions are the comparative relationships of the facial elements in the profile. The present study had a few limitations. The study sample was rather small and the soft tissue trait changes were not examined in subjects with different skeletal patterns, such as long



and short vertical patterns, as was done in the study of Blanchette *et al.*^[3]

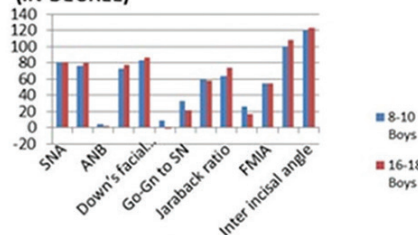
Hard Tissue Measurements

In young (8–10 years) group of boys and girls, there is no significant variation, found in this study. Value of SNB, SL, and ANB is significantly increased in group of boys and girls from young to adult. Angle of convexity is significantly decreased in boys

Table 5

Mean values			
Hard Tissue Angular Measurements (In Degrees)			
		8-10 Boys	16-18 Boys
1	SNA	80.4	81.3
2	SNB	75.8	79.7
3	ANB	4.6	1.6
4	SND	73.2	77.3
5	Down's facial angle	83.2	86.3
6	Angle of convexity	9.2	-0.1
7	GoGn-SN	32.6	22
8	Down'S Y-axis	59	57.4
9	Jaraback ratio	63.20%	73.38
10	FMA	25.8	17.2
11	FMIA	54	54.1
12	IMPA	100.2	108.7
13	Inter incisal angle	119.2	122.8
Hard Tissue Linear Measurements (In Mm)			
		8-10 Boys	16-18 Boys
14	SL	43.6	58
15	U1 to NA	4.4	6.4
16	L1 to NB	4.6	5.3
17	L1 to A-Pog	3.2	3.8
18	U1 to NA (In Degree)	23.4	28.3
19	L1 to NB (In Degree)	32.2	30.5

HARD TISSUE ANGULAR MEASUREMENTS (IN DEGREE)



HARD TISSUE LINEAR MEASUREMENTS (IN mm)

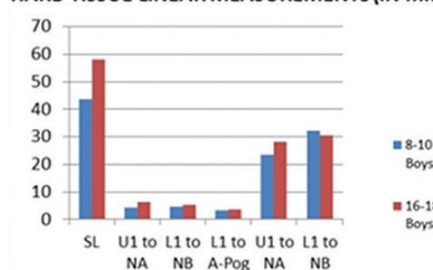
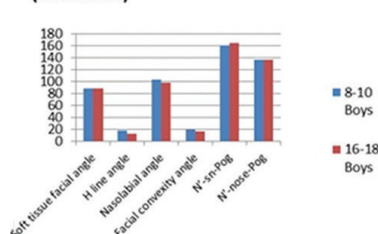


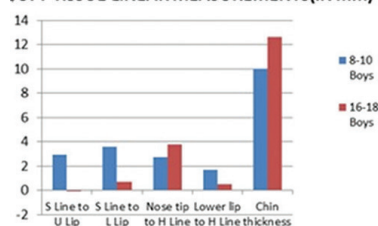
Table 6

Mean values			
Soft Tissue Angular Measurements (In Degrees)			
		8-10 Boys	16-18 Boys
1	Soft tissue facial angle	88.8	89
2	H line angle	18.4	12.7
3	Nasolabial angle	103.2	98.4
4	Facial convexity angle	19.4	17.4
5	N'-Sn-Pog'	160.6	164.4
6	N'-nose-Pog'	136.6	137.1
Soft Tissue Linear Measurements (In Mm)			
		8-10 Boys	16-18 Boys
7	S line to U lip	2.9	-0.1
8	S line to L lip	3.6	0.7
9	Nose tip TO H line	2.7	3.8
10	L lip to H line	1.7	0.5
11	Chin thickness	10	12.6

SOFT TISSUE ANGULAR MEASUREMENTS (IN DEGREE)



SOFT TISSUE LINEAR MEASUREMENTS (IN mm)



and girls both with increase in age. Value of SND and Down's Y-axis is significantly decreased in girls with increase in age rather than boys of that age. Value of Jarabak ratio is significantly increased in boys in adulthood that shows that posterior facial height is increased with age in boys. In adult group of boys and girls, parameters those are significantly

increased are Go-Gn to SN and Down's Y-axis, and parameters those are decreased are Jarabak ratio, IMPA, and L1 to NB.

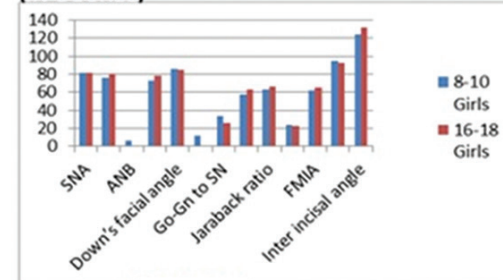
Soft Tissue Measurements

Nasolabial angle is significantly less in boys than girls of same age group (8–10 years). Chin thickness

Table 7

Mean values			
Hard Tissue Angular Measurements (In Degrees)			
		8-10 Girls	16-18 Girls
1	SNA	81.4	81.7
2	SNB	76.6	80.5
3	ANB	6.6	1.2
4	SND	73.4	77.9
5	Down's facial angle	86.4	85
6	Angle of convexity	11.4	0.5
7	GoGn-SN	33.6	25.9
8	Down'S Y-axis	57.4	63.5
9	Jaraback ratio	63.4%	65.94
10	FMA	24.2	22.7
11	FMIA	61.6	64.9
12	IMPA	94.2	92.4
13	Inter incisal angle	124.2	131.4
Hard Tissue Linear Measurements (In Mm)			
		8-10 Girls	16-18 Girls
14	SL	42.4	53.9
15	U1 to NA	4	5.2
16	L1 to NB	4.3	2.7
17	L1 to A-Pog	3	1.7
18	U1 to NA (In Degree)	27.6	27
19	L1 to NB (In Degree)	27.2	22.3

HARD TISSUE ANGULAR MEASUREMENTS (IN DEGREE)



HARD TISSUE LINEAR MEASUREMENTS (IN mm)

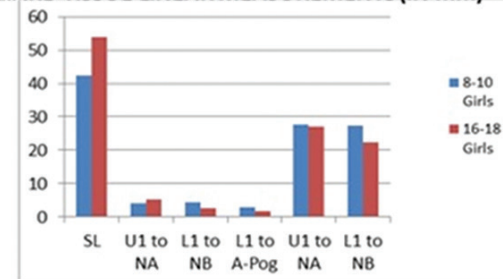
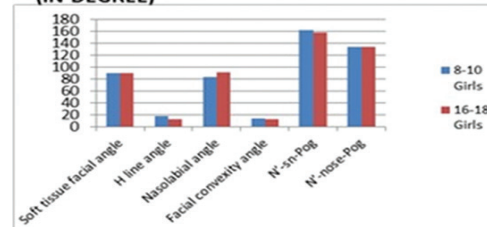


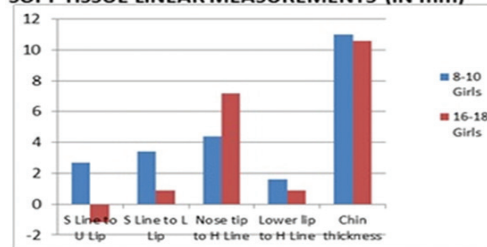
Table 8

Mean values			
SOFT TISSUE ANGULAR MEASUREMENTS (IN DEGREES)			
		8-10 Girls	16-18 Girls
1	Soft tissue facial angle	90	90.6
2	H line angle	18.2	13.2
3	Nasolabial angle	83.4	90.9
4	Facial convexity angle	14.6	12.8
5	N'-Sn-Pog'	162	158
6	N'-nose-Pog'	133.8	134.2
SOFT TISSUE LINEAR MEASUREMENTS (IN mm)			
		8-10 Girls	16-18 Girls
7	S line to U lip	2.7	-1.2
8	S line to L lip	3.4	0.9
9	Nose tip TO H line	4.4	7.2
10	L lip to H line	1.6	0.9
11	Chin thickness	11	10.6

SOFT TISSUE ANGULAR MEASUREMENTS (IN DEGREE)



SOFT TISSUE LINEAR MEASUREMENTS (IN mm)



is significantly increased in adult boys in than adult girls. S line to upper lip and lower lip are significantly decreased in both groups. H line angle is significantly decreased in adult boys than young group of boys.

CONCLUSION

With increase in age, there soft tissue changes are

observed in boys and girls both. Mandibular length and ANB angle are also significantly increased with increase in age in both the groups. In young (8–10 years) group of boys and girls, there is no significant variation found in this study, but in adult (16–18 years) group of boys and girls, changes in position of lower incisors and growth pattern, etc., are quite evident.

Table 9: Significant Parameters on comparing various groups (t value)

HARD TISSUE ANGULAR MEASUREMENT		Boys	Girls	Young	Adult
1	SNA	0.47	-0.13	-0.40	-0.26
2	SNB	-2.61	-1.74	-0.35	-0.55
3	ANB	-2.61	2.97	-1.02	0.45
4	SND	-1.90	-2.49	-0.09	-0.38
5	SL	-4.59	-2.82	0.36	1.05
6	Down's facial angle	-0.79	0.60	-0.89	0.47
7	Angle of convexity	3.54	2.59	-0.51	-0.25
8	GoGn-SN	5.45	2.23	-0.31	-1.75
9	Down's Y-axis	0.74	-3.08	0.72	-3.21
10	Jaraback ratio	-5.45	-0.76	-0.08	2.62
11	FMA	3.17	0.61	1.0	-1.67
12	FMIA	0.02	-0.81	-1.79	-2.54
13	IMPA	-1.75	0.38	1.21	3.53
14	U1 to NA	-1.37	-0.94	0.32	0.81
15	L1 to NB	-0.63	1.32	0.25	2.25
16	L1 to A-Pog	-0.44	1.08	0.16	1.59
17	U1 to NA (In Degree)	-1.11	0.17	-1.28	0.28
18	L1 to NB (In Degree)	0.56	1.23	1.16	3.19
19	Inter incisal angle	-0.54	-0.87	-0.62	-1.26

Table 10: Significant Parameters on comparing various groups (t value)

SOFT TISSUE ANGULAR MEASUREMENT		Boys	Girls	Young	Adult
1	Soft tissue facial angle	-0.15	-0.35	-1.04	-0.87
2	H line angle	2.72	-1.82	0.08	-0.21
3	Nasolabial angle	0.56	-1.59	2.46	1.33
4	N'-Sn-Pog'	-1.66	0.30	-0.57	0.48
5	N'-nose-Pog'	-0.14	-0.16	1.0	0.88
6	Facial convexity angle	1.01	0.41	1.31	1.46
7	S line to U lip	4.93	3.63	0.18	2.32
8	S line to L lip	3.24	2.57	0.17	-0.33
9	Nose tip TO H line	-0.73	-2.10	-1.15	-2.50
10	L lip to H line	1.47	0.84	0.11	-0.59
11	Chin thickness	-3.20	0.31	-0.91	1.87

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