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THE ROENTGENOCEPHALOMETRIC STANDARDS OF THE KOREANS ACCORDING TO THE HIGLEY'S ANALYSIS

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》 國文抄錄 《

Higley氏 分析法에 依한 韓國人 Roentgenographic Cephalometry의 基準値에 關하여

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Higley氏 法에 依한 韓國人의 Roentgenographic Cephalometry의 基準値를 調査하기 爲하여 男子 150名, 女子 140名 合計 290名을 對象으로 하여 이를 分析計測하였다.

對象者의 大部分은 正常的인 咬合者中에서 選擇되었으며 顎骨과 顔面이 잘 調和되고 있었다. 硏究成績은 表의 形式으로 要約되었고 5, 7, 10, 15, 20, 23歲等의 年齡群에 對하여 17項目의 線上計測과 20項目의 角度計測을 施行하였으며 當 計測値의 Mean, Standard deviation, Minimum, Maximum等을 算出하였다.

本 硏究를 通하여 Cranial depth는 白人이 韓國人에 比하여 큰 差異를 보이며(Line-NZ, FT) 顔部에 있어서는 韓國人이 白人에 比하여 後退되었음을 알았다 (Angle-MNS). 이것이 韓國人과 白人의 顔貌의 判異點이라고 思料된다.

INTRODUCTION

In the field of orthodontics it is necessary to understand the growth and development of the dentofacial complex for which many methods of approach have been recommended.

Of them cephalometrics have been recently considered to be the most convenient diagnostic record and it certainly reveals more information about the dentofacial and cranial relationships than any other single diagnostic aid.

Cephalometric roentgenograms have been applied and appraised clinically by Broadbent[5)6)], Brodie[7)], Graber[14)], Tweed[44)45)46)], Margolis[28)], Bjork[4)], Wylie[48)], Downs[10)], Steiner[39)40)41)42)], Higley[16)17)18)19)20)], Coben[8)9)], Sassouni[37)], Begg[2)], Jarabak[24)], Miura[31)32)33)], Ishikawa[22)23)], Iizuka[21)22)] and Sakamoto[35)].

In Korea Ahn[1)], Suh[43)], Yang[49)] reported the results of their respective research in roentgenocephalometrics.

In 1954 L. B. Higley[20)] on the basis of the measurements in his study suggested the possibility of devising transparencies that can be used to detect malocclusion. This produced a method of alalysis.

It may safely be said that these new developments mentioned above have stimulated the necessity of practising such a method of case analysis as Higley's in the Korean orthodontic field.

The purpose of this research is to obtain the reference norms of the Koreans according to the Higley's method of analysis in order to apply his method to maloccluded Koreans.

MATERIALS

Two hundred and ninety roentgenocephalograms of the Koreans in age groups of 5, 7, 10, 15, 20 and 23 of both sexes with normal occlusion were selected for this research. These materials are shown in Table 1.

Table 1. Number of Materials

Age \ Sex	Male	Female
5	25	25
7	25	15
10	25	25
15	25	25
20	25	25
23	25	25
Total	150	140

METHOD

Some of the points, planes, lines and angles selected for obtaining the measurements in this study have also been used by other investigators.

Fig. 1 and 2 illustrate the points, planes, lines and angles.

The following glossary defines them.

GLOSSARY

A—Deepest midline point between anterior nasal spine and prosthion on the premaxilla.

Ar—Junction of the posterior ramus plane and the superstructure of the skull(temporal bone).

Ar'—Junction of the Frankfort plane and a line perpendicular to it from the point Ar.

B—Deepest midline point on the mandible between pogonion and infradentale.

Bp—Bolton point. The highest point on the concavity behind the occipital condyles.

D—Junction of the Y-axis and Frankfort plane.

F—Junction of the Frankfort and facial planes.

G—Junction of the posterior ramus and mandibular planes.

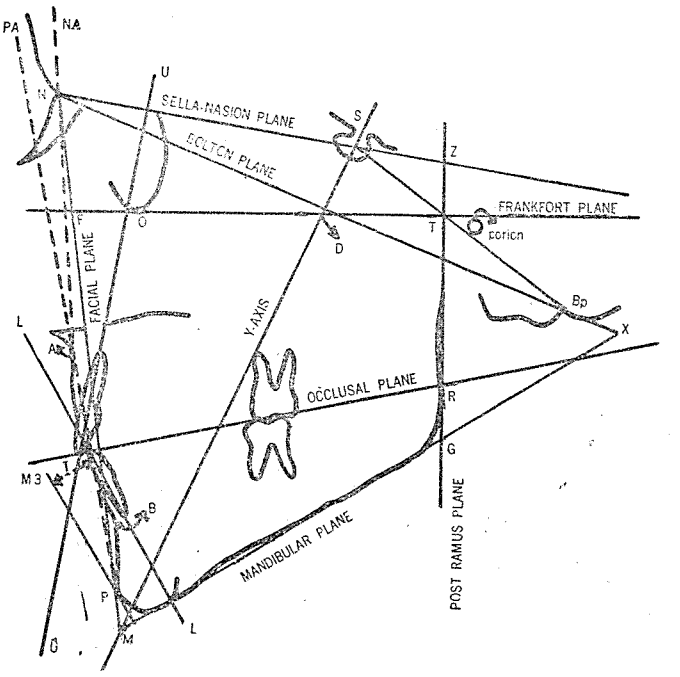

Fig. 1

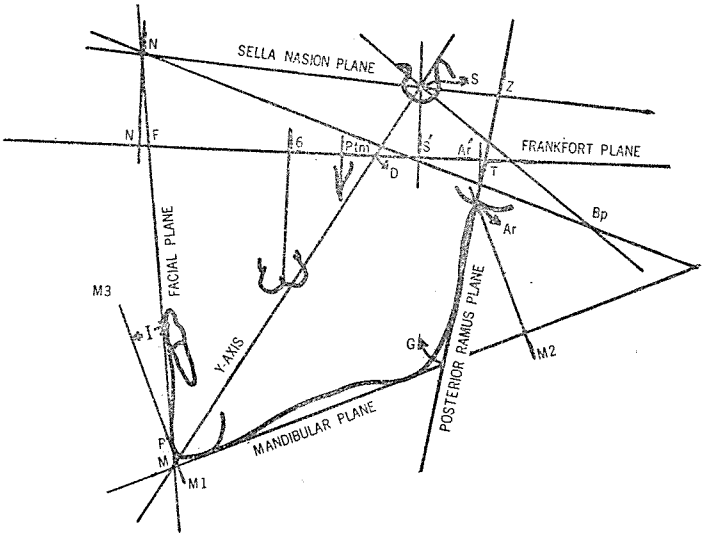

Fig. 2

Figs. 1 and 2. —Schematic drawings illustrating some of the points, lines and angles included in this study.

I—The shortest distance between the labial surface of the mandibular incisor and the line M_1M_3.

LL—A line drawn through the long axis of the lower central incisor and extended to intersect the mandibular plane.

M—Junction of the facial and mandibular planes.

M_1M_2—The distance between the points Ar and P as projected perpendicular to the mandibular plane.

M_1M_3—A line perpendicular to the mandibular plane and tangent to the mandible at the pogonion.

N—Nasion. Junction between the sutures of the frontal and the nasal bones.

N′—Junction of the Frankfort plane and a line perpendicular to it from the nasion.

O—Orbitale. The lowest point on the infraorbital margin of the left orbit.

P— Porion. The highest point on the roof of the left external auditory meatus.

Ptm—Junction of the Frankfort plane and a line perpendicular to it from the pterygomaxillary fissure.

R—Junction of the occlusal and posterior ramus planes.

S—Center of sella turcica. The midpoint of sella turcica arbitrarilly determined.

S′—Junction of the Frankfort plane and a line perpendicular to it from the center of the sella turcica(S).

T—Junction of the Frankfort and posterior ramus planes.

X—Junction of the Bolton and mandibular planes.

Z—Junction of the sella nasion and posterior ramus planes.

6—Junction of the Frankfort plane and a line perpendicular to it from the buccal groove of the maxillary left first permanent molar.

SM—Y-axis. A line extending from the center of sella turcica to point M or mental angle.

F to M—The inside angle formed by the junction of the Frankfort and mandibular planes.

F to Oc—The inside angle formed by the junction of the Frankfort and occlusal planes.

LL to M—The inside angle formed by the junction of the line LL and the mandibular plane.

LL to UU—The inside angle formed by the junction of the lines LL and UU.

NM to AB—The superior anterior angle formed by the junction of the lines NM and AB.

SN to M—The inside angle formed by the junction of the line SN and the mandibular plane.

SN to Oc—The inside angle formed by the junction of the line SN and the occlusal plane.

UU to F—The inferior inside angle formed by the junction of the line UU and Frankfort plane.

UU to SN—The inferior inside angle formed by the junction of the lines UU and SN.

UU— A line drawn through the long axis of the upper central incisor and extended to intersect the Frankfort and sella nasion planes.

RESULT

The results obtained are illustrated in Tables 2 and 3.

Table 2. LINEAR MEASUREMENT

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
	Quadrilateral NMGZ Anterior Side (NM)									
5	25	110.4	4.6	89.8	114.6	25	106.7	4.8	84.7	111.2
7	25	108.8	6.1	94.3	119.5	15	106.9	5.3	95.5	113.8
10	25	121.9	4.3	114.5	130.4	25	117.3	4.3	111.6	123.7
15	25	140.0	5.8	127.1	146.8	25	133.7	5.2	122.8	150.3
20	25	144.8	7.4	129.8	155.4	25	134.8	2.8	128.7	141.0
23	25	145.1	2.8	137.4	154.2	25	135.6	6.4	125.9	145.3
	Quadrilateral NMGZ Inferior Side (MG)									
5	25	66.4	3.4	60.5	74.4	25	64.5	3.1	57.3	69.5
7	25	66.3	3.4	58.3	72.5	15	68.2	3.2	62.5	72.0
10	25	78.3	3.3	72.6	85.5	25	75.8	3.9	70.0	82.8
15	25	90.1	2.7	75.4	89.7	25	82.3	4.3	78.9	93.3
20	25	88.7	2.5	76.6	99.8	25	87.3	3.9	76.8	91.6
23	25	89.0	3.2	83.9	95.6	25	85.6	5.6	79.2	94.9
	Quadrilateral NMGZ Posterior Side (GZ)									
5	25	64.1	3.8	59.3	72.8	25	61.4	2.9	52.3	65.8
7	25	66.7	3.9	61.3	76.7	15	63.5	2.6	58.9	68.9
10	25	70.6	6.1	55.2	83.4	25	69.9	2.8	63.8	73.9
15	25	85.0	7.0	74.2	101.7	25	78.9	5.8	68.8	87.2
20	25	92.7	5.9	81.9	102.8	25	81.4	4.9	69.8	88.7
23	25	92.5	5.4	84.3	100.7	25	83.0	3.9	75.3	91.9
	Quadrilateral NMGZ Superior Side (NZ)									
5	25	78.6	3.0	72.6	83.7	25	74.7	3.2	67.1	80.1
7	25	78.8	2.7	73.5	84.0	15	78.3	3.3	71.8	85.4
10	25	84.7	3.0	77.3	89.5	25	82.9	2.7	75.1	86.5
15	25	92.5	3.4	87.1	99.3	25	89.1	4.3	77.7	96.1
20	25	93.7	4.4	86.5	102.5	25	90.2	3.3	81.8	99.9
23	25	93.9	5.3	85.2	108.5	25	90.2	5.0	80.2	100.0
	Quadrilateral FMGT Anterior Side (FM)									
5	25	82.6	3.3	76.4	91.9	25	81.3	3.4	74.8	91.4
7	25	81.4	2.7	79.5	96.8	15	82.2	3.4	77.4	88.1
10	25	93.7	4.1	87.3	103.2	25	89.8	3.5	83.6	95.4
15	25	111.7	6.3	105.2	121.3	25	103.3	5.8	95.9	119.6
20	25	112.7	7.2	96.6	123.7	25	105.2	4.0	98.1	114.4
23	25	113.0	3.1	105.9	118.7	25	107.0	5.3	97.1	115.0
	Quadrilateral FMGT Posterior Side (GT)									
5	25	52.9	3.7	43.6	60.4	25	50.7	2.7	43.2	56.8
7	25	51.4	3.2	44.7	59.8	15	48.9	2.9	45.1	56.6
10	25	56.4	3.2	49.5	63.1	25	57.4	3.1	53.2	62.4
15	25	69.2	6.9	53.4	79.4	25	68.4	5.0	58.4	76.3
20	25	77.1	4.4	67.1	84.7	25	71.3	3.9	63.9	82.5
23	25	79.8	5.4	69.0	85.4	25	76.5	3.0	62.6	72.4

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
				Quadrilateral FMGT Superior Side (FT)						
5	25	73.2	2.7	68.2	77.2	25	70.0	2.4	64.2	73.7
7	25	73.4	1.6	70.9	76.8	15	73.5	3.0	68.0	73.8
10	25	80.4	2.6	74.6	85.1	25	79.3	2.5	72.7	85.2
15	25	85.5	2.5	77.2	92.0	25	83.3	4.0	76.6	91.3
20	25	89.5	3.8	82.6	95.4	25	87.0	3.8	79.2	95.8
23	25	90.5	5.4	82.7	101.4	25	88.5	5.0	76.5	95.6
				Distance N to S (NS)						
5	25	62.8	2.3	57.2	67.6	25	61.5	2.1	56.2	64.4
7	25	63.5	3.5	59.4	74.2	15	61.9	1.3	58.4	64.4
10	25	66.7	2.4	62.9	71.8	25	65.5	2.1	61.2	69.1
15	25	70.6	2.9	63.7	77.2	25	67.4	1.7	66.2	72.4
20	25	71.9	2.3	67.7	76.5	25	68.3	3.0	62.7	74.4
23	25	27.5	2.8	68.2	77.3	25	69.8	2.7	63.3	75.0
				Distance N to Bp (NBp)						
5	25	116.1	3.3	110.0	123.8	25	113.6	4.1	103.5	120.2
7	25	117.6	2.7	112.7	121.3	15	116.3	2.1	113.6	120.4
10	25	125.4	3.9	117.4	131.3	25	115.4	3.6	111.8	128.7
15	25	134.0	4.5	125.8	142.2	25	127.9	3.9	122.1	134.0
20	25	134.5	3.9	129.4	142.1	25	128.1	5.2	118.6	137.5
23	25	136.5	3.8	125.4	146.5	25	131.7	5.0	120.5	139.1
				Distance S to Bp (SBp)						
5	25	57.6	2.8	47.6	61.8	25	56.8	2.4	52.4	61.9
7	25	59.6	2.0	54.1	62.6	15	58.9	1.8	56.4	62.5
10	25	64.1	2.0	61.0	68.7	25	62.7	2.9	52.6	67.0
15	25	69.4	2.1	66.2	73.2	25	63.6	3.1	59.4	70.1
20	25	69.1	2.0	65.6	72.9	25	65.2	2.5	60.6	70.1
23	25	69.8	3.6	63.0	77.7	25	66.0	3.1	62.0	71.0
				Distance S to M (SM)						
5	25	111.6	3.8	105.2	123.0	25	108.7	2.8	100.5	120.3
7	25	112.0	4.0	99.2	118.1	15	112.3	3.5	104.3	118.1
10	25	126.3	5.1	112.5	138.2	25	121.7	3.5	113.4	127.7
15	25	145.8	5.1	136.9	156.8	25	138.4	5.9	130.4	154.7
20	25	148.7	7.0	135.8	160.3	25	138.8	2.5	134.1	142.6
23	25	148.9	4.3	140.9	157.5	25	140.6	5.6	130.5	151.0
				Distance Labial Surface Mandibular Incisors to Line M_1M_3(I)						
5	25	5.4	0.8	3.8	6.8	25	4.5	1.5	1.6	8.0
7	25	4.9	0.6	3.6	6.5	15	4.3	2.0	0.7	7.7
10	25	6.6	3.0	5.2	8.2	25	4.5	1.4	2.1	6.8
15	25	8.7	2.8	3.9	13.3	25	8.4	3.0	4.0	14.5
20	25	8.2	2.4	3.6	13.2	25	6.7	2.7	3.7	13.4
23	25	7.5	1.7	4.6	10.3	25	7.1	2.7	3.5	12.2

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
	Distance Ar′ to S′ Projected to the Frankfort Plane(Ar′S′)									
5	25	10.9	1.5	7.5	15.3	25	9.8	1.7	5.4	13.0
7	25	12.2	1.8	8.2	15.4	15	13.0	2.7	8.2	18.1
10	25	14.4	2.7	8.8	19.3	25	13.9	1.9	10.4	17.5
15	25	16.6	3.5	10.6	22.4	25	15.4	3.2	10.5	20.9
20	25	17.1	2.8	10.8	23.6	25	18.0	2.2	14.5	22.9
23	25	18.1	3.5	11.3	23.1	25	16.8	2.8	14.2	24.5
	Distance Ptm to S′ Projected to the Frankfort Plane(PtmS′)									
5	25	19.0	1.8	14.1	21.5	25	19.2	2.1	5.2	23.8
7	25	17.7	1.6	15.8	23.1	15	17.6	2.5	12.7	22.0
10	25	20.3	2.2	16.9	25.5	25	20.3	1.9	16.4	26.0
15	25	21.7	2.8	17.3	27.5	25	20.0	1.4	18.1	26.4
20	25	21.5	2.9	16.3	28.6	25	20.1	2.1	15.0	23.2
23	25	20.1	2.5	16.6	25.6	25	18.9	2.3	16.1	23.9
	Distance Ptm to N′ Projected to the Frankfort Plane(Ptm N′)									
5	25	42.9	2.7	36.7	49.2	25	41.5	3.7	36.4	47.0
7	25	44.5	1.6	42.0	48.4	15	43.8	1.3	40.0	45.9
10	25	46.1	2.8	40.5	50.1	25	44.6	2.7	40.0	48.9
15	25	48.5	3.5	42.3	55.5	25	45.9	2.3	42.5	49.4
20	25	49.2	2.5	43.4	53.3	25	46.8	2.7	40.3	51.4
23	25	51.8	4.8	43.5	59.1	25	48.3	2.6	43.5	51.1
	Distance Ptm to 6 Projected to the Frankfort Plane(Ptm6)									
5	25	12.5	2.0	9.6	17.0	25	12.4	2.4	9.0	21.6
7	25	11.6	1.2	10.6	14.0	15	10.5	1.3	9.3	12.9
10	25	14.4	2.1	9.8	17.6	25	16.0	2.2	8.7	19.9
15	25	22.3	2.8	19.3	27.8	25	21.5	2.8	15.7	26.9
20	25	22.6	2.8	18.9	29.3	25	22.3	2.3	17.2	25.1
23	25	24.3	2.9	20.2	30.7	25	22.0	3.0	17.3	28.5
	Distance M_1 to M_2 or Over-All Mandibular Length(M_1M_2)									
5	25	86.8	2.8	82.1	94.1	25	84.4	3.3	78.3	91.4
7	25	87.8	3.0	82.6	93.0	15	87.8	3.0	81.8	93.6
10	25	98.5	3.5	91.5	106.4	25	96.0	3.2	88.6	101.3
15	25	109.8	5.3	98.3	120.9	25	108.7	5.1	99.6	119.1
20	25	111.8	5.9	102.2	123.3	25	110.0	3.9	103.6	118.4
23	25	115.1	5.5	107.5	128.1	25	111.4	3.9	103.0	117.8

Table 3. ANGULAR MEASUREMENT

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
					Quadrilateral NMGZ Angle at Gonion (MGZ)					
5	25	127.6	4.7	119.0	137.0	25	127.1	3.3	122.5	131.5
7	25	123.9	6.2	109.5	135.5	15	126.6	5.7	113.0	139.0
10	25	125.5	3.5	118.0	131.0	25	123.7	4.9	115.5	134.5
15	25	122.9	6.6	110.5	135.0	25	124.0	2.9	120.0	129.0
20	25	119.7	8.0	103.5	134.5	25	120.0	5.7	111.5	132.5
23	25	119.9	4.3	111.5	137.5	25	123.9	4.0	116.5	130.5
					Quadrilateral NMGZ Angle at Menton (NMG)					
5	25	65.4	2.4	60.5	70.5	25	65.1	2.2	62.0	69.0
7	25	67.2	3.6	60.5	73.5	15	65.6	4.5	58.5	75.5
10	25	64.2	2.6	58.5	70.0	25	66.1	3.1	59.0	71.5
15	25	64.6	3.8	57.0	70.0	25	63.4	3.1	57.5	68.5
20	25	66.7	4.5	59.5	77.5	25	65.6	3.8	59.5	72.0
23	25	66.6	3.6	60.0	72.0	25	63.8	3.7	58.0	73.5
					Quadrilateral NMGZ Angle at Nasion (MNS)					
5	25	73.4	4.4	58.0	80.5	25	75.2	3.1	67.5	81.0
7	25	69.3	5.9	59.0	78.0	15	72.5	6.4	58.5	83.0
10	25	78.4	3.2	69.0	83.5	25	78.0	2.4	73.0	83.0
15	25	79.8	3.1	73.5	85.5	25	79.0	4.1	75.0	81.5
20	25	78.2	3.2	71.5	84.5	25	78.9	2.2	73.5	81.5
23	25	79.8	3.1	73.5	85.5	25	78.2	3.1	71.5	84.0
					Quadrilateral NMGZ Angle at Point Z (GZN)					
5	25	90.8	4.8	83.0	101.0	25	91.5	2.6	87.0	96.5
7	25	89.7	4.1	83.5	97.0	15	89.9	3.0	85.0	99.0
10	25	91.4	2.8	87.0	98.5	25	92.1	3.8	82.0	97.5
15	25	93.1	3.0	86.5	95.5	25	92.0	3.8	83.0	99.0
20	25	94.5	4.4	86.0	102.5	25	95.1	2.9	90.0	100.5
23	25	91.9	6.3	80.5	100.5	25	92.7	3.4	84.0	98.0
					Quadrilateral FMGT Angle at Point F (MFT)					
5	25	88.3	4.0	80.5	98.5	25	85.7	2.5	80.5	93.0
7	25	84.9	1.5	82.5	88.0	15	84.7	2.3	80.0	89.0
10	25	86.6	2.6	81.5	91.0	20	88.0	2.3	83.5	93.0
15	25	89.7	2.3	84.0	93.0	25	91.5	3.1	84.5	96.0
20	25	89.5	1.9	86.5	94.0	25	90.1	2.6	84.5	94.0
23	25	89.2	3.1	85.5	96.5	25	88.5	2.5	85.5	94.0
					Quadrilateral FMGT Angle at Point T (FTG)					
5	25	79.0	4.6	68.5	87.5	25	81.4	3.0	76.5	87.5
7	25	81.2	3.2	75.0	88.0	15	82.5	3.2	74.5	87.0
10	25	82.9	3.3	77.5	89.0	25	82.0	3.4	76.0	88.0
15	25	82.9	3.1	76.0	88.5	25	81.4	3.9	75.5	87.0
20	25	83.9	4.6	75.0	92.0	25	84.0	3.3	79.5	91.0
23	25	84.7	4.2	76.0	91.5	25	83.3	3.7	74.5	87.5

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max	N	Mean	S.D.	Min.	Max.
	Angle at Junction of Facial and Bolton Planes (MNB$_P$)									
5	25	60.9	3.3	57.5	74.5	25	59.8	1.9	57.5	64.0
7	25	60.6	1.3	58.5	62.5	15	61.8	2.8	52.0	68.0
10	25	62.2	2.4	57.0	66.5	25	63.0	1.9	56.8	64.0
15	25	62.6	2.7	59.0	69.0	25	62.8	2.4	58.5	69.5
20	25	62.5	2.2	59.0	66.5	25	63.5	2.2	57.5	66.0
23	25	65.0	4.2	60.5	76.0	25	63.4	2.1	60.5	66.5
	Angle at Junction of Y-Axis and Sella-Nasion Plane (NSM)									
5	25	72.3	2.3	67.0	79.0	25	71.3	3.0	64.5	76.5
7	25	69.5	3.1	62.5	75.5	15	70.3	2.8	65.5	75.0
10	25	70.5	2.9	66.5	77.5	25	70.0	2.4	64.5	73.5
15	25	71.6	3.3	65.5	77.0	25	70.8	2.7	67.5	76.0
20	25	72.5	2.9	68.0	78.5	25	72.3	3.2	69.0	80.5
23	25	71.5	3.3	67.0	75.5	25	72.7	3.0	66.5	76.5
	Angle at Junction of Y-Axis and Frankfort Plane(MDF)									
5	25	59.7	3.2	55.0	66.0	25	60.9	2.8	52.0	67.5
7	25	61.8	2.1	58.0	64.5	15	62.6	2.2	57.0	66.5
10	25	61.3	2.2	56.0	63.5	25	60.3	3.1	54.5	68.0
15	25	61.6	2.8	56.5	66.5	25	58.9	3.3	53.5	66.5
20	25	62.1	2.4	57.0	65.5	25	60.8	3.0	56.0	69.5
23	25	62.1	2.9	56.0	66.0	25	62.3	2.6	57.0	67.0
	Angle at Junction of Mandibular and Bolton Planes (MXN)									
5	25	54.6	2.4	50.5	59.5	25	54.6	2.8	49.0	59.5
7	25	50.9	3.8	44.0	58.5	15	52.3	5.1	43.5	59.5
10	25	53.9	3.6	47.0	62.5	25	50.9	3.9	45.0	60.0
15	25	53.0	4.7	41.0	62.5	25	52.0	3.4	46.5	58.5
20	25	50.4	4.8	36.0	58.5	25	50.7	5.0	44.0	64.0
23	25	48.9	4.4	41.5	56.0	25	52.5	2.1	41.5	61.5
	Angle at Junction of Frankfort and Mandibular Planes (F to M)									
5	25	27.2	3.0	21.5	35.0	25	28.2	3.3	21.0	36.0
7	25	28.5	2.4	23.0	34.0	15	29.7	4.2	21.0	35.5
10	25	28.3	3.6	22.5	38.5	25	26.0	3.1	19.5	30.5
15	25	26.2	5.4	17.0	34.5	25	25.2	4.0	18.0	31.5
20	25	23.7	5.0	12.0	31.5	25	24.1	4.5	14.5	28.0
23	25	24.5	4.9	18.0	33.5	25	28.1	5.0	16.0	36.5
	Angle at Junction of Mandibular and Sella Nasion Planes (SN to M)									
5	25	39.2	2.1	33.0	43.0	25	38.9	3.3	32.5	43.5
7	25	36.8	3.3	31.0	43.0	15	37.5	4.7	30.0	45.0
10	25	37.4	3.4	32.5	44.0	25	36.2	3.3	30.0	42.0
15	25	36.1	6.5	23.0	44.5	25	37.6	4.0	30.5	47.0
20	25	34.7	5.7	22.5	44.5	25	35.4	4.7	28.0	48.0
23	25	33.5	4.6	26.0	39.5	25	37.5	3.7	30.5	44.5

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
	Angle at Junction of Frankfort and Occlusal Planes (F to Oc)									
5	25	10.0	2.2	6.0	15.5	25	9.9	4.0	3.5	21.5
7	25	10.4	1.6	8.5	13.0	15	9.5	3.9	5.0	18.0
10	25	10.0	2.3	6.0	14.5	25	8.9	1.7	4.5	12.0
15	25	6.9	3.0	2.0	13.5	25	4.8	3.9	0.0	16.5
20	25	6.0	2.4	2.5	11.5	25	5.5	1.6	2.5	8.5
23	25	5.8	3.0	1.5	10.5	25	5.8	2.7	1.5	10.0
	Angle at Junction of Sella Nasion and Occlusal Planes (SN to Oc)									
5	25	21.8	3.4	15.5	30.5	25	20.1	3.5	13.5	28.0
7	25	19.5	2.0	16.5	24.5	15	20.6	3.7	13.5	28.0
10	25	19.0	2.5	15.0	22.5	25	19.3	2.0	15.0	21.5
15	25	16.1	4.8	6.0	22.0	25	17.0	4.7	11.0	26.0
20	25	16.0	4.2	9.0	23.5	25	15.3	3.6	8.5	21.5
23	25	14.0	4.0	8.0	22.5	25	15.0	3.0	9.5	19.5
	Inside Obtuse Angle at A or Junction of Lines NA and PA (NAP)									
5	25	11.1	1.8	5.0	14.5	25	13.6	3.9	3.5	18.5
7	25	11.5	2.6	6.0	17.0	15	10.0	4.5	4.0	17.0
10	25	6.7	2.0	3.0	11.5	25	7.7	2.5	3.5	13.0
15	25	4.6	2.9	0.5	10.5	25	5.8	3.7	0.0	12.0
20	25	4.2	2.8	0.0	10.5	25	3.8	1.6	1.0	7.5
23	25	4.0	1.9	1.0	7.5	25	3.7	2.9	1.0	9.5
	Angle at Junction of Facial and AB Planes (NM toAB)									
5	25	5.5	2.2	1.5	13.5	25	6.1	2.0	2.0	9.5
7	25	6.4	1.8	3.5	10.0	15	4.9	1.8	1.5	7.5
20	25	5.5	1.8	2.0	9.0	25	5.5	1.7	2.0	9.0
15	25	5.5	2.0	1.5	8.5	25	4.0	3.1	1.5	9.5
20	25	4.6	1.9	1.5	9.0	25	4.1	2.1	1.5	9.5
23	25	4.0	2.0	1.5	9.0	25	5.2	2.6	1.5	10.0
	Vertical Axis of Lower Incisor to Mandibular Plane (LL to M)									
5	25	84.3	5.7	73.5	94.5	25	87.0	4.7	80.5	98.5
7	25	88.3	3.6	83.0	98.0	15	87.3	4.8	75.0	93.0
10	25	89.3	4.8	80.0	97.0	25	91.4	5.7	80.5	100.5
15	25	91.2	4.9	80.0	100.0	25	88.0	5.8	77.0	97.0
20	25	88.7	4.0	81.5	99.5	25	91.3	4.1	81.5	98.5
23	25	90.4	2.4	84.5	95.5	25	93.1	6.2	84.5	109.0
	Angle at Junction of Upper and Lower Vertical Axes(LL to UU)									
5	25	144.7	6.0	130.5	157.5	25	138.5	7.4	127.0	149.0
7	25	144.0	5.3	135.0	151.0	15	139.6	6.0	121.5	152.0
10	25	129.8	5.8	119.5	141.5	25	121.8	4.5	113.0	118.5
15	25	122.6	6.4	109.5	133.0	25	124.6	6.7	115.0	132.5
20	25	130.2	7.7	117.0	149.0	25	125.5	5.2	113.5	133.5
23	25	128.1	7.9	115.0	142.0	25	121.5	4.7	114.0	129.5

Age in Years	MALE					FEMALE				
	N	Mean	S.D.	Min.	Max.	N	Mean	S.D.	Min.	Max.
	Posterior Inferior Angle at Junction of Line UU and Frankfort Plane (UU to F)									
5	25	104.5	6.3	89.0	114.0	25	105.1	4.6	98.0	114.5
7	25	98.3	4.2	89.0	106.0	15	103.9	6.8	93.5	119.0
10	25	113.1	3.6	109.5	110.5	25	117.7	5.3	107.5	126.0
15	25	119.4	3.8	115.5	118.5	25	121.5	4.2	114.0	129.0
20	25	116.7	4.6	110.5	125.5	25	118.7	3.4	114.0	125.5
23	25	116.6	5.9	106.0	125.5	25	118.9	4.1	111.5	124.5
	Posterior Inferior Angle at Junction of Line UU and Sella Nasion Plane (UU to SN)									
5	25	90.4	3.8	82.0	97.0	25	95.1	3.8	89.0	103.0
7	25	92.1	2.3	88.0	96.5	15	95.3	5.9	85.5	100.5
10	25	106.2	5.4	97.5	115.0	25	108.0	5.3	95.0	116.0
15	25	110.1	4.7	102.5	120.0	25	111.5	3.6	105.0	116.5
20	25	104.4	6.5	86.0	114.0	25	108.3	4.8	96.0	112.5
23	25	106.7	7.6	95.5	117.5	25	111.1	3.3	104.0	115.5

Summary and Conclusion

Higley proposed the use of celluloid transparancies prepared for males and females for each of the age levels as illustrated in Fig. 3 for the clinical application of some of the average linear and angular measurements accumulated in this research.

These should include the quadrilaterals NMGZ and FMGT plus the position of either the second primary or the first permanent molar and the position and inclination of the maxillary and mandibular incisors.

When a similar cephalometric roentgenogram is secured of a given patient the normal standard transparency for the same age and sex can be placed over it for a comparison of the size and relationship of the patient's dental, facial and cranial structures.

By doing so it can be determined whether the patient's structures are below, equal to, or above the average size, or whether the angular relationships of the structures are more acute, than equal to, or more obtuse than the average.

For the axes of the teeth are measured against four different horizontal planes in this research this is a very realistic approach because it reduces the possible error of referring to a single plane which can be abnormal in position itself in indivisual cases.

And standard deviation chart can be gained and applied clinically from the Table 2 and 3 for each age and sex.

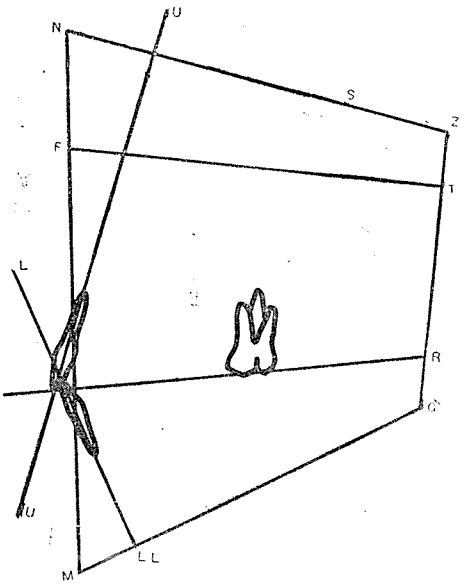

Fig. 3—Drawing illustrating the proposed celluloid transparencies for the boys and girls for each age level. These include the quadrilaterals NMGZ and FMGT, occlusal plane, position of maxillary left molar and position and inclination of maxillary and mandibular incisors.

For the purpose of observing the difference between the Koreans and the north American white people of northern European ancestry 7 year old male groups of both sides were selected for the comparison out of the results of the author's and Higley's respective researches.

The following conclusion was reached through this comparative study.

Cranial depth of white people is longer than that of the Koreans (Line-NZ, FT).

Bony chin showed a more retruded position in the Koreans than white people (Angle-MNS).

Difference of interinicsal angle seems to be caused by the difference of the growth patterns in the course of their growth and development.

The facts stated above represent major differences of dento-facial complexes of growing Koreans and the north American white people of northern European ancestry.

Linear Measurement	Mean	S.D.	Higley's Mean
NM	108.8	6.1	106.9
MG	66.3	3.4	70.5
GZ	66.7	3.9	64.0
NZ	78.8	2.7	86.4
FM	81.4	2.7	79.2
GT	51.4	3.2	47.1
FT	73.4	1.6	79.7
NS	63.5	3.5	67.7
NBp	117.6	2.7	121.7
SBp	59.6	2.0	59.4
SM	112.0	4.0	113.5
I	4.9	0.6	5.7
Ar′-S′	12.2	1.8	13.7
Ptm S′	17.7	1.6	18.9
Ptm N′	44.5	1.6	48.2
Ptm 6	11.6	1.2	13.0
M_1 M_2	87.8	3.0	91.9

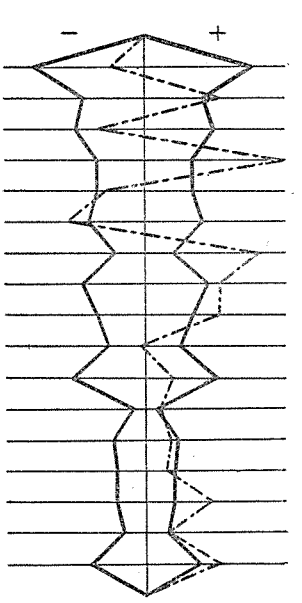

Fig 4. Comparison of dento-facial pattern by linear measurements between the Koreans and North American white people of northern European ancestry.

Angular Mesurement	Mean	S.D.	Higley's Mean
MGZ	123.9	6.2	126.8
NMG	67.2	3.6	69.7
MNS	69.3	5.9	77.1
GZN	89.7	4.1	86.4
MFT	84.9	1.5	83.3
FTG	81.2	3.2	80.2
MNBp	60.6	1.3	61.2
NSM	69.5	3.1	67.1
MDF	61.8	2.1	60.8
MXN	50.9	3.8	49.1
F∼M	28.5	2.4	26.9
SN∼M	36.8	3.3	33.2
F∼Oc	10.4	1.6	13.2
SN∼Oc	19.5	2.0	19.3
NAP	11.5	2.6	8.0
NM∼AB	6.4	1.8	4.5
LL∼M	88.3	3.6	91.4
LL∼UU	144.0	5.3	135.1
UU∼F	98.3	4.2	106.3
UU∼SN	92.1	2.3	100.0

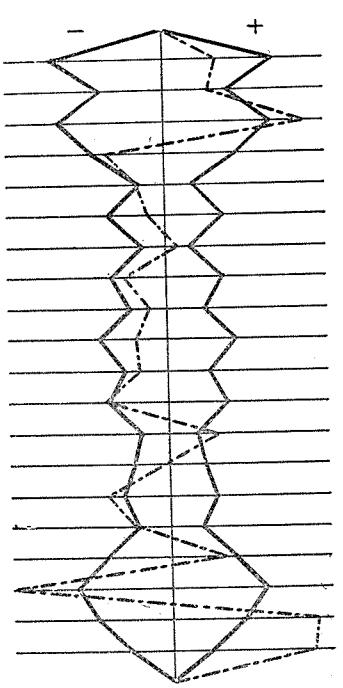

Fig 5. Comparison of dento-facial Pattern by angular measurements between the Koreans and North American white People of northern European ancestty.

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