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Facial Morphology in Class II Division 1 Malocclusion Cases

SUMMARY

The aim of this study was to obtain the data for jaw skeletal variations and maxillary and mandibular position according to cranial base in individuals with Class II Division 1 malocclusion, as well as their length. To accomplish that goal, 52 subjects aged 14 to 19, with Class II Division 1 malocclusion have been examined, and than compared with control group, consisting of 40 subjects with normal occlusion. A profile tele-roentgen film was taken of each patient and following parameters were analysed: angle SNA, angle SNB, angle ANB, Sna-Snp (maxillary length) and Go-Gn (mandibular length). Patients were divided in 4 subgroups consisting of both genders: Subgroup A, with the ante-position of both jaws; Subgroup B with maxillary ante-position and mandibular retro-position; Subgroup C with maxillary normo-position and mandibular retro-position; Subgroup D with retro-position of both jaws.

The maxilla was in retro-position most frequently (53.97% in girls and 65.47% in boys), rarely in ante-position (34.5% and 23.0%), and non-frequently in normo-position (11.53% in both sexes). The mandible was most frequently in retro-position (88.4% in girls and 92.27% in boys). The distance Sna-Snp decreased non-significantly in girls and boys, except in A subgroup, where the distance was significantly increased (p<0.05). The distance Go-Gn in girls was decreased with different significance, except in subgroup with maxillary normo-position and mandibular retro-position. In boys, the decrease was significant in A and B subgroups (p<0.01), as well as in D subgroup (p<0.05).

It can be concluded that malocclusion Class II Division 1 is not a unique clinical entity, but spectrum of many combinations of components, with distinct dental and skeletal variations in length and position.

Keywords: Facial Morphology; Skeletal Variations; Class II Division 1 Malocclusion

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Introduction

Malocclusion Class II Division 1, because of its frequency, was always challenging for examination. There is universal agreement for its actual morphology, which is postnormal relationship of mandibular dentition to its maxillary opponent, and protrusion of maxillary frontal segment, frequently with deviations in dental arches, deviations in vertical and transversal relationship between jaws and coronal compression. Frequently the lower anterior segment shows supra-version, a tendency toward flattering and some irregularities. Maxillary arch sometimes shows demonstrable narrowing in the premolar region, which is responsible for “V” arch shape. Other regular characteristic is abnormal muscle function. With the increase of overjet, the lower lip cushions to the lingual aspect of these teeth. During swallowing, abnormal mental muscle activity and aberrant buccinator activity, together with compensatory tongue function and changed tongue position, tend to accentuate the narrowing of the maxillary arch, labial inclination of maxillary incisors and flattering of mandibular incisors[1,5,6,8,10,16].

Aetiology is always in relationship with all prenatal and postnatal influences, which can alter normal physiological processes. But, fundamental cause for malocclusion is heredity. Other factors are: civilized live manner and habits, decreased masticatory function and interweave of different genetic characteristics from heterogeneous geographic, ethnic and race groups.

Many orthodontic authorities say that Class II Division 1 malocclusion is more than irregular teeth and lack of space. There is no constancy in eruption of the upper first permanent molar and there is a great diversity in skeletal and dental basis. Research reports on disto-occlusion are huge, but there is not a universal agreement for the actual morphology of this abnormality, many parameters tend to be changed differently.

Interestingly, there are different opinions about variations in jaws relationship according to anterior cranial base, and many authors elaborated different morphologic relationships[6,10,12,13].

These differences among results and conclusions of various studies are possibly due to diversities among different skeletal Class II types. Because in malocclusion Class II Division 1 face morphologic characteristics depend on clinical form of the malocclusion, and as several skeletal combinations exist that cannot be evaluated only by clinical examination and gnathometric analysis, the aim of this study was to obtain the data for jaw skeletal variations and maxillary and mandibular position according to cranial base, as well as their length.

Material and Methods

52 subjects, aged 14-19 years, with Class II Division 1 malocclusions have been examined, and than compared with the control group consisting of 40 subjects of the same age with normal occlusion. A profile tele-roentgen film was taken of each patient and following parameters were analysed: angle SNA, angle SNB, angle ANB, distance Sna-Snp (maxillary length) and distance Go-Gn (mandibular length), as shown on figure 1.

Results and Discussion

According to angles of maxillary and mandibular prognathism, we formed 4 subgroups in the investigated group (Tab. 1):

- Subgroup A: anteposition of both jaws;
- Subgroup B: maxillary anteposition and mandibular retroposition;
- Subgroup C: maxillary normoposition and mandibular retroposition;
- Subgroup D: retroposition of both jaws.

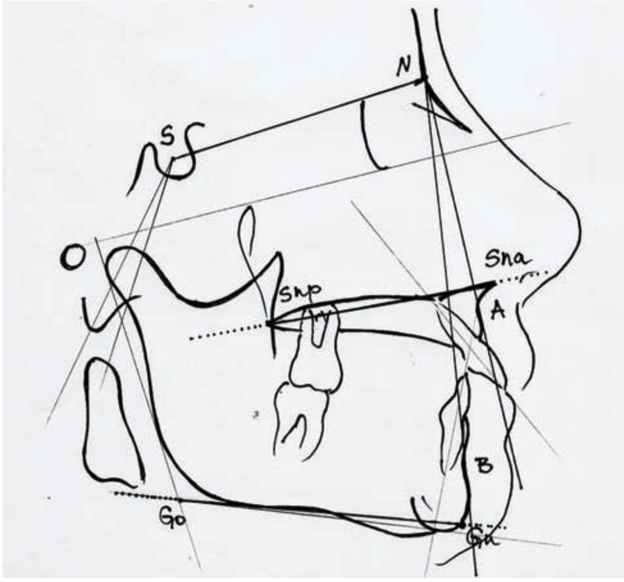

Figure 1.

Table 1. All subgroups, according to sex, frequency and age

Frequency of all subgroups, according of sex and age			
malocclusion sII/1	sex	frequency	age
subgroup A	f	11,53 %	15,2
	m	7,7 %	15,5
subgroup B	f	23,07 %	14,8
	m	15,3 %	14,9
subgroup C	f	11,53 %	16,6
	m	11,53 %	15,0
subgroup D	f	53,87 %	16,0
	m	65,47 %	14,7

Sagittal Jaw Position

The results for variations of sagittal jaw relationship according to cranial base, are in accordance with findings of other authors[1,6,10,12,13,17,22], but the different frequency was established.

Maxillary and mandibular positions, in accordance to anterior cranial base and parameters in all subgroups, in females and males, are given on figures 2 and 3, and tables 2 and 3.

Maxillary Position in Accordance to Anterior Cranial Base

The results are in agreement with those of Renfroe[18], McNamara[12], Rusich-Tasich[22] and Pancherz[14], but not with results of Riedel[19] and Bishara[1], who considered that there is no significant differences in maxillary A-P relation in Class I and Class II, and those of Rosenbloom[21], who found that dominant type is maxillary anteposition.

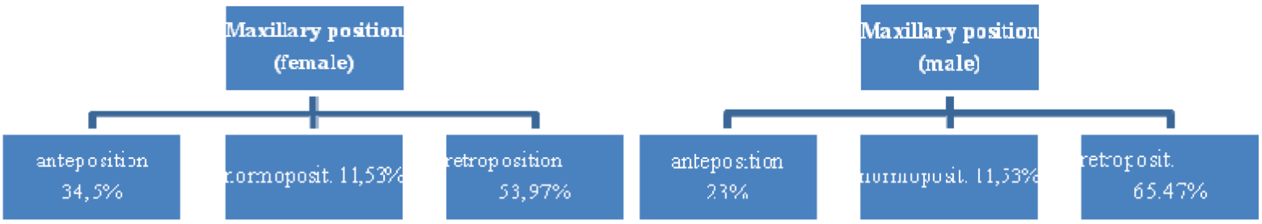

Figure 2. Frequency of maxillary position in accordance to anterior cranial base, in females and males

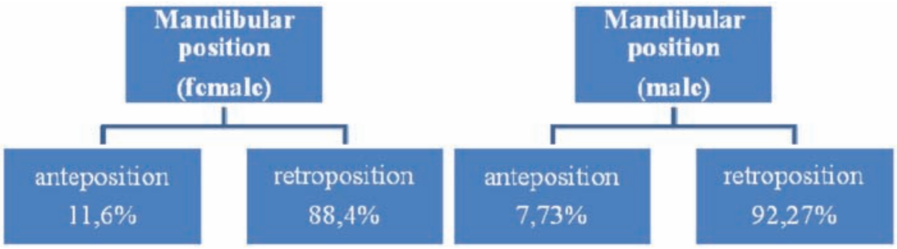

Figure 3. Frequency of mandibular position in accordance to anterior cranial base, in females and males

Table 2. Values of investigated parameters in all subgroups, for females

	subgroup A	subgroup B	subgroup C	subgroup D	normal occlusion
angle SNA	88.00* * *	84.00* *	82.00	78.390* *	80.140
angle SNB	82.170* * *	76.250 *	76.50*	72.10* * *	77.880
Angle ANB	5.830* *	6.90* * *	5.50* *	6.40 * * *	2.430
Sna-Snp	56.83	56.92	56	57.53	57.59
Go-Gn	72.83*	73.58	77.5	72.75* *	76.0

(* low significance, ** high significance, *** very high significance)

Table 3. Values of investigated parameters in all subgroups, for males

	subgroup A	subgroup B	subgroup C	subgroup D	normal occlusion
angle SNA	87.00 ***	83.750 ***	82.00*	79.460	80.330
angle SNB	81.00 ***	75.630 *	75.830*	72.770 ***	77.470
Angle ANB	6.00 ***	6.630 **	5.50**	6.470 ***	2.580
Sna-Snp	60.0 *	55.5	56	55.75	56.38
Go-Gn	80.75 **	78.5	77.5	72.65 *	76.79

(* low significance, ** high significance, *** very high significance)

Studies of longitudinal growth of untreated individuals, done by Riolo et al[20] and Broadbent et al[2], have revealed that the relationship of the maxillary complex to upper facial structures stays relatively constant during growth as shown by angle SNA. In this study, the position of maxillary complex in Class II individuals was variable. Most frequently, maxilla was in retroposition relative to cranial base structures. Maxillary skeletal retrusion was usually found in conjunction with excessive vertical development. Solow and Kreiborg[23] suggest that a lowering of the mandible is usually prompted by altered respiratory function, which may induce a stretching of the facial soft tissue layer. These tissues can than inhibit the forward development of the naso-maxillary complex. The results of this study seem to support that hypothesis.

The distance Sna-Snp is decreased non-significantly in girls and boys, except in A subgroup, where the distance was significantly increased ($p<0.05$).

The change in size and proportion of the upper face during growth and development is familiar to us from several biometric studies. The maxillary growth in length is directed towards the palatine bone, and it is accompanied by periosteal apposition at the maxillary tuberosity. The growth in height takes place at the sutures - articulations of the frontal and zygomatic processes, and by periosteal apposition on the lower border of the alveolar process. The direction of tooth eruption is predominantly vertical, but if there is a large component of forward eruption (heredity or habits), the alveolar prognatism will be increased and the alveolar arch elongated forwards.

Mandibular Position According to Anterior Cranial Base

Results are compatible with those of Renfroe[18], Hitchoch[8], Moyers[11], McNamara[12], Deguchi[4], Karlsen[9], Rusich-Tasich[22], Pancherz[14] and Bischara[1], but they are not in agreement only with those of Cassidy[3] and Rosenbloom[21], who state that mandible is mostly in normal position. These results indicate that retrusion of the mandible most commonly occur as contributing factor to Class II malocclusion. This is not surprising in view of its developmental characteristics. Embriologically, the mandible is not derived from the primary cartilaginous skeleton; for the most part, it develops independently, lateral to Meckel's cartilage. The cartilage of the mandibular condyle has been shown to be distinct from other growth cartilages of both the craniofacial region and the appendicular skeleton[5,10,16]. Many experimental studies of condylar growth adaptations to alterations in biomechanical and biophysical environment of the craniofacial region in rhesus monkeys and other animal species, indicate that mandibular growth can be increased or decreased by changing the mandibular postural position[11,15] . These studies suggest that growth of the condylar cartilage may be in part adaptive, so condylar response to alterations in the environment may more closely resemble that of periosteum than that of the epiphyseal cartilages of long bones. Since growth of the mandible can be influenced by alterations in the functional environment, it seems to us that abnormal muscle function, altered occlusal inter-digitation and other factors may affect the size and shape of the mandible in the growing Class II individuals.

Many orthodontics consider that there are 2 ways in which the mandible can be situated posteriorly: structurally (various dimensions of the mandible, e.g. body length, ramus height, gonial angle; or the glenoid fossa can be placed further back than in neutrocclusion) and functionally (acquired muscle contraction patterns may cause the mandible to assume a posterior position as a result of sucking habit or by congenital origin).

The distance Go-Gn in girls is decreased with different significance except in subgroup with maxillary normoposition and mandibular retroposition. In boys, the decrease is significant with $p<0.01$ in A and B subroups, and $p<0.05$ in D subgroup. Literature shows abundant data with opposite opinions for this parameter. Renfroe[18], Cassidy[3] and Rusic-Tasic and Tijanic[22] are of the opinion that the mandible is not insufficient in this malocclusion and that the problem is not in its length. Gilmore[7], Fisk [6], Rakosi[17], Karlsen[9] and Bishara[1], as we did, established a decrease of the mandibular length.

Growth of the jaws usually correlates with the physiologic events of puberty. In both the maxilla and the mandible, growth in the width is completed first, then growth in length and finally growth in height. Growth in width of both jaws, including the width of the dental arches, tends to be completed before the adolescent growth spurt. Growth in length of both jaws continues throughout the period of puberty. Growth in vertical height of the jaws and face continues longer in both genders than growth in length[16].

Malocclusion arises throughout variation in the normal developmental process, so orthodontic treatment often involves manipulation of skeletal growth or camouflage, but always rests on a precise diagnosis. The key decision in treatment planning for patients with skeletal malocclusion is to select the best approach: growth modification, if possible, provides the ideal results; camouflage represents a compromise that may be quite acceptable in moderate skeletal discrepancies; surgical correction is reserved for the most severe problems.

Conclusions

We establish existence of 4 subgroups, in both sexes. They are: Subgroup A, with the anteposition of both jaws; Subgroup B with maxillary anteposition and mandibular retroposition; Subgroup C with maxillary normoposition and mandibular retroposition; Subgroup D with retroposition of both jaws. Class II Division 1 malocclusion is not a unique clinical entity, but spectrum of many combinations of components, with many dental and skeletal variations in lenght and position. Most frequently, the maxilla is in retroposition, rarely in anteposition, and sometimes in normoposition. The most frequently, the mandible is in retroposition.

The distance Sna-Snp was decreased non-significantly in girls and boys, except in A subgroup, where the distance was significantly increased ($p<0.05$). The distance Go-Gn in girls was decreased with different significance, except in subgroup with maxillary normoposition and mandibular retroposition. In boys, the decrease was significant with p<0.01 in A and B subroups, and p<0.05 in D subgroup.

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