Craniofacial Growth in Children Affected by Juvenile Idiopathic Arthritis Involving the Temporomandibular Joint: Functional Therapy Management

Giampietro Farronato* / Vera Carletti** / Cinzia Maspero*** / Davide Farronato**** / Lucia Giannini***** / Claudio Bellintani ******

*The **aim** of this study was twofold: 1) to asses the effects of a functional appliance on condyles damaged by juvenile idiopathic arthritis (JIA). and 2) to evaluate its ability to reduce alterations in craniofacial development. **Study design:** Seventy-two JIA patients with temporomandibular involvement, ages ranging between 4 and 16 years, were treated. All of them presented temporomandibular joint involvement. They were treated with an activator and followed for 4 years. **Results:** At the second examination, it was possible to observe a reduction in mandibular retrusion and in the sagittal discrepancy between mandible and maxilla, a reduction in the angle of divergence, a counterclockwise rotation of the mandible, a reduction of the gonial angle, a longer mandibular ramus, a reduction in the discrepancy between anterior and posterior height caused by an increase in posterior height and a forward positioning of the chin. **Conclusion:** The functional appliance reduces the severity of facial alterations improving mandibular and condylar growth.*
***Keywords:** juvenile idiopathic arthritis, functional appliance, temporomandibular involvement.*
J Clin Pediatr Dent 33(4):351–358, 2009

INTRODUCTION

Juvenile idiopathic arthritis (JIA) is a childhood disease, beginning before the age of 16, and characterized by arthritis of unknown etiology and persisting for at least 6 weeks.[1] A recent study on JIA demonstrated that it is the most common rheumatic disease afflicting children. Every year, 0.008 to 0.22 children *per* 1,000 develop JIA, with a prevalence range from 0.07 to 4.01 children *per* 1,000.[2] The development of the disease is highly variable: some children recover completely while others live with the disease for a long time and often with invaliding complications.[3]

* Giampietro Farronato, MD, DDS Professor and Chairman, Department of Orthodontics, The University of Milan, Italy
** Vera Carletti, DDS, Postgraduate Resident, Department of Orthodontics, The University of Milan, Italy
*** Cinzia Maspero, MD, DDS, Postgraduate Resident, Department of Orthodontics, The University of Milan, Italy
**** Davide Farronato, DDS, PhD, Postgraduate Resident, Department of Orthodontics, The University of Milan, Italy
***** Lucia Giannini DDS, Graduate Resident, Department of Orthodontics, The University of Milan, Italy
****** Claudio Bellintani MD, DDS, Postgraduate Resident, Department of Orthodontics, The University of Milan, Italy

Send all correspondence to: Giampietro Farronato, Via Commenda 10, 20122 Milan, Italy.

Tel: (39) (02) 50320240.

E-mail: giampietro.farronato@unimi.it

In 1997 a task force of rheumatologists from all over the world completed a classification of JIA. Actually, JIA is not a single disease but one composed of 7 subtypes (systemic, oligoarthritis, polyarthritis RF negative, polyarthritis RF positive, psoriasic arthritis, enthesitis-related arthritis, others).[1] The most frequent types are systemic, oligoarthritis, and polyarthritis forms. The difference between them is the number of joints affected by the disease. Oligoarthritis is also called pauciarticular, affecting from 1 to 4 joints at the onset (during the first 6 months). The polyarthritis subtype involves 5 or more joints during the first 6 months of the disease,[1] and it is divided into 2 forms: RF positive (positive to the rheumatoid factor) and RF negative. JIA is characterized by acute phases of recruitment and remission. Prognosis of these patients is variable, depending on the prevalence of their acute or chronic phases.

The temporomandibular joint (TMJ) is now recognized as one of joints that can be damaged by JIA.[4] The TMJ can be affected unilaterally or bilaterally. Generally TMJ involvement starts unilaterally and becomes bilateral as the disease worsens.[5] If the condylar contribution to the growth process is hindered, it is possible that growth will be altered because of its contribution to the physiological growth of the mandible, mainly the ramus, while the body increases in unison with dental eruption.[6] In this context, TMJ alteration can modify facial development and reduce mandibular growth in association with other characteristics. Severity and duration of joint involvement, disease onset and course, subtypes, and subject's age all influence facial morphology.[7] However, a

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micrognathic mandible with mandibular retrognathism unavoidably cause skeletal Class II.[8] These alterations result in facial and occlusal disharmony, with differences depending on whether the TMJ involvement is bilateral or unilateral. If bilateral, mandibular hypoplasia with repercussions on esthetics and masticatory efficiency will be evident. This characteristic, first described by Diamantberger in 1890, is known as "bird-face."[9] If the affliction is unilateral, serious asymmetries will be noticeable.[10] Posterior facial height is severely decreased. This reduced posterior vertical development causes a backward rotation of the mandible with a consequent opening of the gonial angle and anterior facial height increase.[11]

The mandibular plane steepens because of the posterior mandibular rotation.[4] Posterior facial height is associated with an increment of bone apposition in the gonial region and with an accentuation of the antegonial notch.[12] These alterations influence oral function. The neuromuscular system is confronted with occlusal instability and there is a consequent progressive modification of the masseteric muscle fibers. As a result, alteration of the neuromuscular system impedes the physiological development of the facial bones and aggravates the corresponding facial anomalies.[13] Subjects with unilateral TMJ involvement present functional alterations such as asymmetry in opening and protrusive movements.[14] Clinically, a reduction in maximum opening and condylar translation may be present. Radiographically, condylar lesions vary remarkably depending on the severity of the TMJ involvement from a slight erosion of the joint's cortical surface to more serious problems such as decapitation of the condylar head.[5] Identifying and diagnosing affected children at an early stage of the disease is complicated; the first visit to a specialist is often too late. Prompt diagnosis makes it possible a multidisciplinary approach to treatment with considerable prognosis improvement. These children are often not seen until an abnormal growth pattern has already been established.[6] It is necessary to continuously examine the occlusion and TMJ of these children so that an early diagnosis of TMJ involvement and a favorable prognosis can be assured.[14]

Radiographic diagnosis of TMJ involvement is based on some typical signs such as reduction of the articular space, loss of normal relationship during opening, and condylar erosion. If arthritis involves only one condyle, there will be an asymmetry in mandibular growth with the chin deviated to the affected side. If it is bilateral, the consequent mandibular hypoplasia can be observed developing into a typical bird face. Clinically, there is evidence of an asymmetry in mandibular shape and movements and mandibular hypoplasia. A Class II open bite can be observed in bilateral involvement.

MATERIALS AND METHODS

Seventy-two JIA patients between 4 and 16 years of age with TMJ involvement were treated at the Department of Orthodontics, Milan University's Institute of Clinical Dentistry. Records included the family, physiological, psychological, and pathological questions. Clinical assessment included an intraoral examination, an extraoral evaluation of facial type and soft tissue shape, and a thorough TMJ examination. This exam included an evaluation of mouth-opening ability, articular noises and pain at rest and during movement, and articular and muscular swelling. The radiographic records incorporated a panoramic radiograph, a lateral radiograph, frontal (PA) radiograph, and a TMJ tomogram in full intercuspation and at maximum opening to show condylar shape and position. A wrist radiograph can be taken for evaluation of the growth pattern. Following these appraisal procedures, clinicians provided each patient with a 3-dimensional diagnosis.[15]

The JIA-affected children were followed through using lateral cephalograms taken at the beginning and approximately 4 years later. The cephalograms were taken with the head positioned in fixed profile and the teeth in full intercuspation. After the cephalograms were digitized, cephalometric analyses were performed to determine the existence of craniofacial differences between JIA-affected patients undergoing activator therapy and patients not undergoing activator therapy.

The 72 patients were treated with a modified activator, an acrylic resin-based appliance with an occlusal plane for teeth to contact and 2 lingual flanges to maintain the mandible in a forward position (Figure 1).

The construction wax bite must be recorded in an advanced mandibular position and with minimal vertical height to maintain the mandible in protrusion and avoid an anterior vertical height increase.

Approximately 3 months after appliance delivery, a thin acrylic layer was placed on the activator's posterior areas. This layer was applied once a month to allow condylar distraction and promote an increase in condylar bone formation. The thin acrylic resin layers were added monthly to obtain a progressive and gradual upward and forward mandibular rotation achieved through condylar growth.

Treatment is considered completed when the end of skeletal growth has been reached and when the disease has

Figure 1. the functional appliance

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been in remission for a long period of time. If an acute, inflammatory exacerbation should occur, therapy must be started immediately.

For this study, patients lacking compliance, could not be regularly followed, were in therapy for less than 4 years, or nearly at end of growth at the beginning of therapy, were excluded. Among the patients in therapy, 22 (18 females and 4 males) were selected under the following inclusion criteria:

- Patients continuing with follow-up at the Institute of Clinical Dentistry after recovery
- Patients classifiable by Durban's criteria (persistent arthritis of unknown etiology lasting at least 6 weeks with onset before 16 years of age)[1]
- Patients with lateral cephalograms, one taken at the beginning of therapy and one after four years approximately
- Patients with TMJ involvement confirmed during radiographic and clinical examination
- Patients in activator therapy during the period between the 2 lateral cephalograms

The mean age of patients selected were 9 years 0 months (SD = 1.84), the youngest was 6 years 2 months old, and the oldest was 12 years 9 months when the first cephalogram was taken. At the time of the second cephalogram, the average age was 13 years 7 months (SD = 2.16), the youngest child was 9 years 5 months, and the oldest was 17 years 3 months. The second cephalogram was usually taken 4 years 9 months (SD = 1.28) after the first. All patients showed TMJ involvement at the beginning of the study, 8 unilateral and 14 bilateral. In accordance with Durban's criteria, the patients were subdivided into 2 subtypes: the first, with 15 patients, had the polyarticular form; the second, with 7 patients, had the pauciarticular form. For the control group, data from Stabrun (1991) were selected because this was a comprehensive, longitudinal study of a large sample with control of growth changes in children affected by JIA. The study included 26 children (20 females and 6 males) seen at the University of Oslo, Faculty of Dentistry, Pediatric Division, at the Oslo Sanitetforening Rheumatism Hospital. These patients were affected with JIA and had radiographic TMJ involvement. The average age was 8.4 years (the youngest being 3.9 years old and the oldest, 11.7) at the beginning of the study and 14.7 years after 6 years (the youngest being 10.2 and the oldest, 17.7).

In our sample, a cephalometric analysis of both cephalograms was performed and the results were compared with the control group. The cephalometric analysis was performed by computerized analysis, measuring planes and angles as selected by Stabrun by a single observer (Table 1). Moreover, the cephalometric analyses were repeated 15 days later and the average between these 2 measurements was calculated. The Student *t* test was used for comparing the initial with the 4 years of therapy data. (Figure 2) (Table 2).

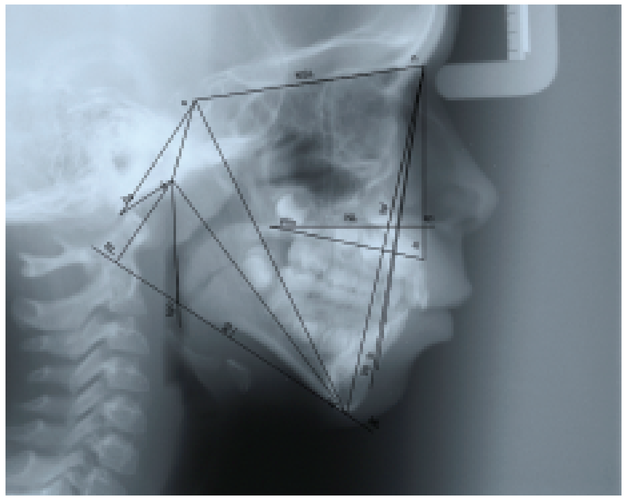

Figure 2. angles and planes selected for the cephalometric analysis

RESULTS

The beginning examination showed that, in relation to the cranial base, the maxilla was in a normal position and the mandible was retrognathic. The mandible was positioned backward and downward in relation to the cranial base and the maxilla.

The NSL/ML and NL/ML angles increased, indicating a tendency to an increase in divergence between the cranial base and the mandibular plane and between the nasal and the mandibular planes. The maxilla displayed the correct inclination with respect to the cranial base.

Posterior height diminished because of the chronic condylar inflammation. Angle S-Ar/RL increased, indicating posterior rotation of the mandible. The S-N-Ba and S-N-Ar angles were unchanged. The S-N-Pg angle diminished remarkably, indicating the presence of mandibular (chin) retrognathism. This was confirmed by a very low N-S-Gn angle.

The mandibular ramus (Ar-TGo and Ar/ML) became shorter, without a significant increase in the antegonial notch. The gonial angle (ML/RL) increased, confirming the posterior rotation of the mandible and the bite opening.

Changes during the four years of observation

During successive examinations a slight reduction of the S-N-A angle (P = 0.241) was found, but the position of the maxilla in relation to the cranial base remained within physiological range. The S-N-B angle (P = 0.340) slightly increased, causing a slight reduction in mandibular retrognathism. The skeletal Class II persisted; however, there was a reduction of the sagittal discrepancy between the mandible and the maxilla (P = 0.107). Reduction of the mandibular and cranial base angle (P = 0.149) and posterior rotation of the nasal plane (P = 0.016) caused a reduction of the maxillary-mandibular divergence (P = 0.295). The S-Ar/RL angle

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Table 1. Angles and planes selected for the cephalometric analysis:

SNA (°)	Sella-Nasion -A
SNB (°)	Sella-Nasion-B
ANB (°)	A-Nasion –B
NL/ML (°)	Nasal plane/Mandibular plane
NSL/NL (°)	Sella-Nasion plane/Nasal plane
NSL/ML (°)	Sella-Nasion plane /Mandibular plane
SNBa (°)	Sella-Nasion-Basion
SNAr (°)	Sella-Nasion- Articulare point
S-Ar/RL (°)	Sella- Articulare point/ Ramus plane
N-Gn (mm)	Nasion- Gnation
A-Ptm (mm)	A-pterygomaxillary fissure
N-SP' (mm)	Nasion-Sp'
SP'-Gn(mm)	Sp'- Gnation
N-SP'/ SP'-Gn (ratio)	Nasion-Sp'/ Sp'- Gnation
SP'-Gn/ N-Gn (ratio)	Sp'- Gnation/ Nasino- Gnation
S-Go (mm)	Sella-Gonion
N-Gn/ S-Go (ratio)	Nasion- Gnation/ Sella-Gonion
Ba-Ar(mm)	Basion- Articulare point
SNPg (°)	Sella-Nasion –Pogonion
BNPg (°)	B- Nasion –Pogonion
NSGn (°)	Nasion-Sella- Gnation
Ar-ML (mm)	Articulare point- Mandibular plane
Ag-ML (mm)	Antegonial notching- Mandibular plane
Ar-Go (mm)	Articulare point-Gonion
Gn-Ar (mm)	Gnation- Articulare point
ML/RL (°)	Mandibular plane-Ramus plane

Table 2. Method error

	Beginning therapy 1st measurement	After 4 years 1st measurement	Beginning therapy 2nd measurement	After 4 years 2nd measurement
SNA (°)	0.7	0.6	0.8	0.7
SNB (°)	0.8	0.7	0.8	0.7
ANB (°)	0.5	0.4	0.6	0.4
NL/ML (°)	1.1	1.3	1.3	1.4
NSL/NL (°)	0.6	0.5	0.8	0.7
NSL/ML (°)	1.3	1.2	1.3	1.2
SNBa (°)	1.0	0.9	1.1	1.0
SNAr (°)	1.2	1.2	1.4	1.4
S-Ar/RL (°)	1.6	2.1	1.6	2.0
N-Gn (mm)	1.6	1.6	1.3	1.3
A-Ptm (mm)	0.7	0.7	0.8	0.7
N-SP' (mm)	0.7	0.8	0.7	0.8
SP'-Gn (mm)	1.0	1.0	1.1	1.0
N-SP'/ SP'-Gn (ratio)	0.0	0.0	0.0	0.0
SP'-Gn/ N-Gn (ratio)	0.0	0.0	0.0	0.0
S-Go (mm)	1.5	1.2	1.7	1.4
N-Gn/ S-Go (ratio)	0.0	0.0	0.0	0.0
Ba-Ar (mm)	0.6	0.7	0.8	0.8
SNPg (°)	0.0	0.9	0.0	0.6
BNPg (°)	0.2	0.2	0.2	0.3
NSGn (°)	0.8	0.9	0.8	1.0
Ar-ML (mm)	0.9	1.0	1.0	1.0
Ag-ML (mm)	0.1	0.1	0.1	0.1
Ar-Go (mm)	1.0	0.9	1.1	0.9
Gn-Ar (mm)	1.9	1.6	1.9	1.6
ML/RL (°)	1.2	1.3	1.2	1.4

Method error is calculated as standard deviation / √No patients by Statistica per discipline biomediche / Stanton A. Glantz ; A. Decarli. - Milano: McGraw Hill, 2007

(*P* = 0.218) reduction caused a forward rotation of the mandibular ramus, allowing a protrusion of the mandible and a reduction of the open bite (*P* = 0,104)

During the second examination, the ML-RL angle (*P* = 0.467) decreased; causing a reduction of the gonial angle, confirming the bite closure. The antegonial notch slightly increased (*P* = 0.019). The mandibular ramus, measured on Ar-TGo (*P* = 0.001) and Ar/ML (*P* = 0.001), was longer at the second observation in spite of the erosive action of the JIA on the condyle. The ratio between maxillary and mandibular height [N-Sp' /Sp'–GN] (*P* = 0.474) did not vary. The N-GN/S-TGo (*P* = 0.153) ratio decreased, reducing the discrepancy between anterior and posterior height as the result of a greater posterior increase. A reduction of chin retrognathism was due to an increase of the S-N-Pg angle (*P* = 0.428) The N-S-GN angle (*P* = 0.001) also increased, indicating an advanced position of the chin when compared with the initial measurements. All linear measurements increased, probably because the subjects under investigation were assessed during their growth and development period (Table 3).

Comparison among data

When the results obtained in this study are compared with those obtained by Stabrun (1991), a significant improvement is evident in patients treated with the functional appliance. The position of the mandible with respect

Table 3. Facial morphology in 22 patients affected by Juvenile Idiopathic Arthritis in therapy with a functional appliance at beginning therapy and after four years

Variable	Mean at baseline examination	Standard deviation at baseline examination	Mean at 4-year follow-up	Standard deviation at 4-year follow-up	Sign. test (P)
SNA (°)	80,3	3,36	80,7	3,23	NS
SNB (°)	74,1	3,93	74,2	3,59	NS
ANB (°)	6,8	2,30	6,5	1,97	NS
NL/ML (°)	32,1	5,33	31,9	6,21	NS
NSL/NL (°)	9,2	2,91	10,3	2,67	**
NSL/ML (°)	41,3	6,24	42,2	5,98	NS
SNBa (°)	129,7	4,78	130,5	4,64	NS
SNAr (°)	119,4	6,01	121,2	6,01	*
S-Ar/RL (°)	153,6	7,64	151,5	10,19	NS
N-Gn (mm)	106,2	7,56	117,1	7,79	***
A-Ptm (mm)	45,5	3,54	49,0	3,47	***
N-SP' (mm)	47,0	3,28	51,7	3,92	***
SP'-Gn (mm)	59,2	4,98	65,4	4,81	***
N-SP'/ SP'-Gn (ratio)	0,8	0,05	0,8	0,05	NS
SP'-Gn/ N-Gn (ratio)	0,6	0,04	0,6	0,04	NS
S-Go (mm)	61,0	7,20	67,9	6,05	***
N-Gn/ S-Go (ratio)	1,8	0,13	1,7	0,12	NS
Ba-Ar (mm)	16,3	3,20	15,9	3,39	NS
SNPg (°)	74,1	4,34	74,1	4,20	NS
BNPg (°)	0,0	0,95	-0,1	1,02	NS
NSGn (°)	72,1	3,98	73,3	4,21	***
Ar-ML (mm)	27,6	4,41	31,0	4,76	***
Ag-ML (mm)	0,7	0,45	1,0	0,84	**
Ar-Go (mm)	35,6	4,81	39,9	4,21	***
Gn-Ar (mm)	90,2	8,88	98,8	7,89	***
ML/RL (°)	128,8	5,84	128,7	6,45	NS

Test t on differences at baseline and 4-years follow-up.
NS, $P>0,05$;* $P<0,05$;** $P<0,01$;*** $P<0,001$

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to the cranial base is slightly more forward after therapy in the subjects treated with the appliance, while in untreated subjects, the mandible has a backward position and displays a posterior rotation during growth. In addition, the position of the chin (S-N-Pg), positioned back in these subjects, is now forward when compared with its position at the initial examination; while in Stabrun's subjects, the chin had moved back when measured during the second examination. The A-N-B angle is reduced in subjects treated with the activator, while it is increased in those without the appliance: the skeletal Class II improved in the former and appeared to be aggravated in the latter. The A-N-B angle decreased, demonstrating the effectiveness of the functional appliance as therapy for JIA. A posterior inclination of the nasal plane in relation to the cranial base between the first and second observations was observed in both activator-treated and untreated subjects. There was a reduction in the divergence between the maxilla and the mandible, confirmed by the reduction of the NL/ML angle in both samples as well.

A very significant outcome is represented by the S-Ar/RL angle. In untreated subjects, this cephalometric value increased because of mandibular backward rotation, while in treated subjects there was a reduction of this angle. The appliances allow the mandible to rotate forward and upward with a decreasing skeletal Class II and hyperdivergence. The mandibular ramus was longer at the second examination in both studies. The gonial angle decreased in both observations; however, this reduction was so minor that we believe the gonial angle was not modified. The antegonial notch was deeper in the untreated subjects (Table 4).

Table 4. Differences of facial morphology between patients affected by Juvenile Idiopathic Arthritis in therapy with a functional appliance and patients in Stabrun's study

Variable	Mean at baseline examination in this study	Mean at 4-year follow-up in this study	Mean at baseline examination in Stabrun's study	Mean at 4-year follow-up in Stabrun's study
SNA (°)	80,3	80,7	81,6	81,6
SNB (°)	74,1	74,2	75,2	75,0
ANB (°)	6,8	6,5	6,4	6,7
NL/ML (°)	32,1	31,9	29,6	28,8
NSL/NL (°)	9,2	10,3	8,0	8,6
NSL/ML (°)	41,3	42,2	37,5	37,4
SNBa (°)	129,7	130,5	132,2	132,1
SNAr (°)	119,4	121,2	119,4	119,2
S-Ar/RL (°)	153,6	151,5	150,3	155,6
N-Gn (mm)	106,2	117,1	100,4	111,1
A-PTM (mm)	45,5	49,0	44,9	48,8
N-SP' (mm)	47,0	51,7	44,1	48,8
SP-Gn (mm)	59,2	65,4	56,3	62,2
N-SP'/SP'Gn (ratio)	0,8	0,8	0,8	0,8
SP'-Gn/ N-Gn (Ratio)	0,6	0,6	0,6	0,6
S-go(mm)	61,0	67,9	60,8	68,1
N-Gn/ S-Go (ratio)	1,8	1,7	1,7	1,6
Ba-Ar(mm)	16,3	15,9	16,2	17,9
SNPg (°)	74,1	74,1	74,7	74,3
BN-Pg (°)	0,0	-0,1	-0,5	-0,7
NSGn(°)	72,1	73,3	70,1	71,6
Ar-ML (mm)	27,6	31,0	29,0	34,6
Ag-ML (mm)	0,7	1,0	2,5	3,4
Ar-Go (mm)	35,6	39,9	36,7	41,2
Gn-Ar(mm)	90,2	98,8	87,1	94,5
ML/RL (°)	128,8	128,7	127,5	122,3

DISCUSSION

It is accepted that JIA can affect the TMJ. Articular damage in a growing subject causes facial deformity. In Milan University Department of Orthodontics, Institute of Clinical Dentistry, a large number of patients affected by JIA seek consultation. During the last 10 years, hundreds of patients with JIA have been treated for TMJ involvement. Oral health care has been provided in collaboration with the Department of Juvenile Rheumatology of De Marchi Institute and with the Center for Rheumatic Children at Gaetano Pini Hospital where these children were treated comprehensively for systemic ailments.

A multidisciplinary approach allows a more effective diagnosis, remarkably increasing the possibility to reduce the detrimental effects of the disease on the TMJ and to prevent detrimental consequences on the mandible.[16] The obscure onset of TMJ involvement in JIA and the serious bone damage, already present at the beginning of the disease, mandate a careful orthodontic assessment of these patients. The importance of early treatment with a functional appliance is demonstrated here, not only to prevent deformities and functional damage, but also to mitigate the subjective symptoms during an acute phase of the disease, poorly controlled by pharmacologic therapy alone.[17]

In patients affected by JIA, the modified activator has a double function: the first in the active inflammatory phase and the second in the remission phase. During the active phase, it protects the TMJ from damage from the injurious effects of the synovitis at the joint surface through condylar distraction. During the remission phase, the activator has an orthopedic function, modifying the growth pattern by muscular stretching beyond the rest position, as is apparent from data provided herein. A normalized mouth opening can be noticed through clinical observation. Patients describe reduced pain and less frequent pathologic noise from the TMJ during movement. The decrease in both the ANB and articular angles shows a mandible growing forward and upward, in contrast to the disadvantageous growing pattern (Figure 3).

Therapy improves the potential of skeletal growth through traction on the condylar surface by the cartilaginous fibers causing condylar increase over time.[18] This is possible because patients are young and, frequently, the treatment begins during an accelerated period of skeletal growth, the most favorable time to wear a functional appliance. Even in patients not undergoing skeletal growth, the appliance has an important role as interceptive therapy; since it protects the TMJ during the active phase of the disease. Because the authors believe in the effectiveness of this appliance, it was not possible to select a control group followed by an external examination. Although having a single examiner for the 2 groups of patients could assure better results, the medical

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ethics committee disallows patient selection for the control group, depriving them of the benefits of therapy.

The quality of life of JIA-affected children can only get worse; therefore, any improvement in their life standard must be made. A functional appliance can be a valid aid to improve their quality of life because it is an alternative to maxillofacial surgery. With the appliance, patients are affected by a minor initial discomfort that disappears after few days, while maxillofacial surgery can present more severe complications. Whenever possible, it is better to discourage surgery based on the serious systemic problems of the disease. In the active inflammatory phase, the appliance helps reduce the pain and, in combination with corticosteroid therapy, decreases clinical symptoms.

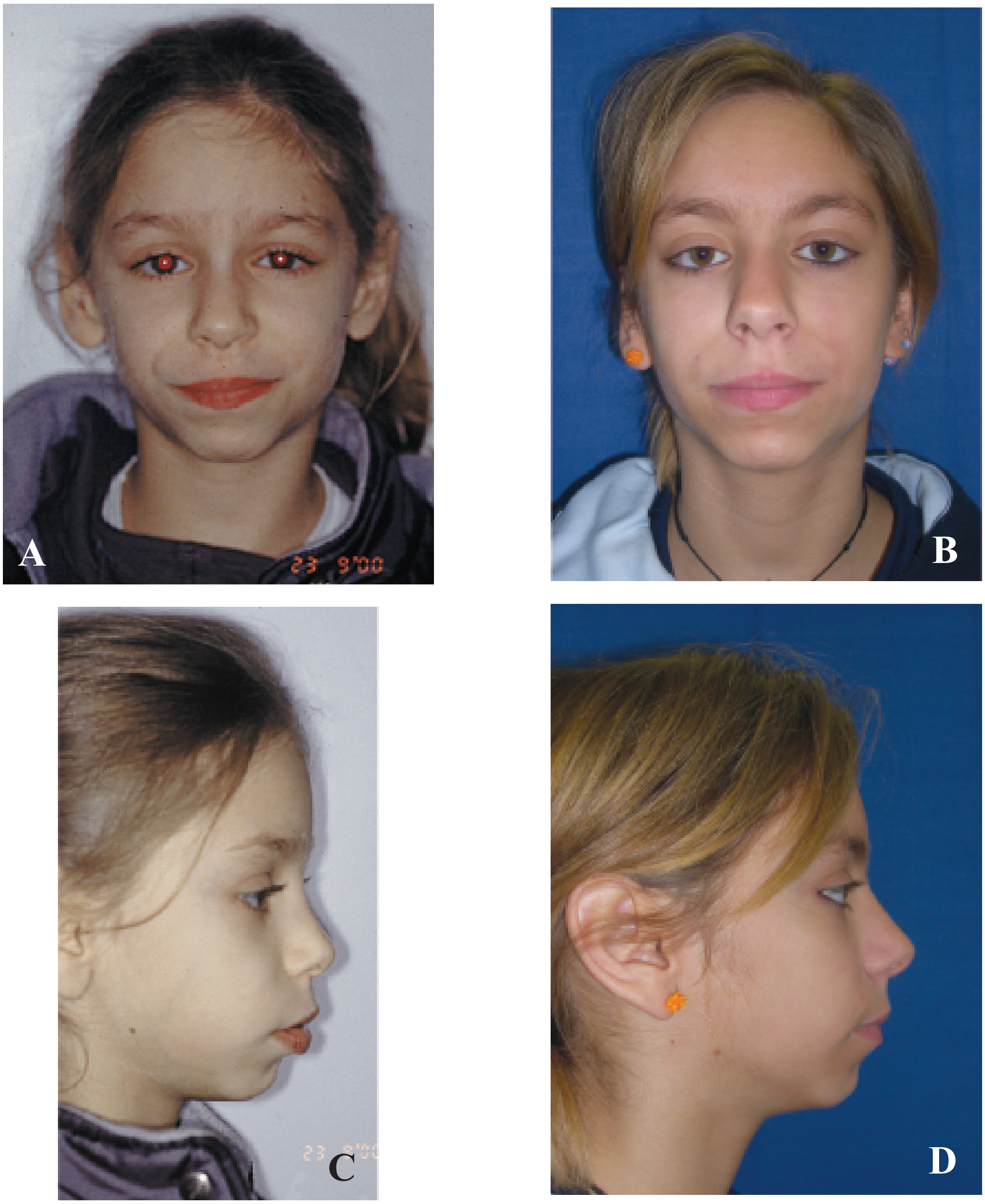

Figure 3. Pretreatment and posttreatment frontal and lateral view. The laterognatia has been corrected

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In long remission phases, it stimulates condylar growth, reducing the unfavorable growth pattern; thus, the patient can grow without developing serious deformations. Condylar growth promotes the development of a longer mandibular ramus during a simultaneous anterior rotation of the mandible.

Mandibular ramus growth, associated with the anterior rotation of the mandible, causes a forward movement and a counterclockwise rotation of the mandible with gradual bite closure and the resolution of the skeletal Class II. The mandibular movement allows a reduction of one of the most characteristic clinical aspects, the bird face, and a simultaneous functional improvement. These patients have no difficulty opening their mouth and the articular noises are remarkably reduced as well. Moreover, when the functional appliance is used from childhood, it prevents the vicious circle between neuromuscular alterations and facial deformation that aggravate the course of the disease.

The alterations here described represent the outcome of a multidisciplinary approach that speeds the diagnosis and decreases the eventual TMJ involvement. Functional therapy will produce these effects if children are cared for in an orthodontic specialty center as early as possible.

CONCLUSIONS

Results obtained from this study confirm that functional therapy has important effects on craniofacial growth of children affected by JIA with TMJ involvement.

Changes during the 4 years of observation and comparison between patient and control group explain how the activator works and how it modifies mandibular growth.

Early diagnosis and treatment planning might improve results obtained by this type of therapy and might improve the esthetic and functional aspects of rehabilitation.

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