

# Treatment of Craniomandibular Disorders in Children and Young Adults

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*A group of 99 children and young adults referred to a Swedish oral health sciences center were retrospectively evaluated regarding symptoms, signs, diagnoses, treatment, and treatment outcome. The most common symptoms in this patient group were headaches (52%), temporomandibular joint clicking (49%), pain at chewing (47%), and pain at wide mouth opening (46%). Common diagnoses were anterior disc displacement (32%) and craniomandibular disorders of muscular origin (16%). After treatment, 91% of the children and young adults reported themselves to be better or free of symptoms. A treatment modality often used was the occlusal splint, and it was concluded that using conservative methods led to good treatment outcomes in this patient group.*

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**E**pidemiologic studies of craniomandibular disorders (CMD) in children and young adults are mainly of a cross-sectional nature.<sup>1-14</sup> Such studies have shown that the signs and symptoms of CMD are common in these age groups, increase with age, and are mainly of a mild character.

There are only a few longitudinal studies, and they indicate fluctuations of symptoms and signs of CMD.<sup>15-20</sup> Magnusson et al<sup>16</sup> found that nearly 50% of young adults who exhibit temporomandibular joint (TMJ) clickings at the age of 20 years did not have clickings at the age of 15 years, and 50% of the adolescents with clickings at the age of 15 years do not exhibit clickings at the age of 20 years. Wanman and Agerberg<sup>18,19</sup> report that 9% of the individuals in their longitudinal studies presented symptoms of CMD and 29% presented signs of CMD at three examinations during a 2-year period. In their opinion, the group of patients with both signs and symptoms were at a greater risk of developing CMD.<sup>20</sup>

Studies on the treatment of CMD in children and young adults are few.<sup>18,21</sup> The need for treatment among young adults has been estimated at 5% to 11.5% by Wanman and Agerberg<sup>18</sup> and Ohno et al.<sup>22</sup> The subjectively (patient's opinion) and objectively (dentist's opinion) assessed needs for treatment of CMD are not always identical. Magnusson et al<sup>23</sup> judge the estimated objective need for treatment to be 27% and the demand or subjective need for treatment to be only 3%.

The aim of this investigation was to examine diagnoses, symptoms, and signs of CMD and study different treatment modalities and outcomes of these disorders in a group of children and young adults.

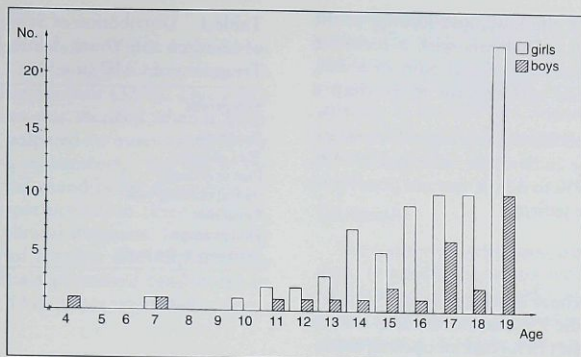


Fig 1 Age and sex distribution of study population (n = 99).

## Materials and Methods

During 1987 and 1988, 105 children and young adults were referred to the Department of Stomatognathic Physiology at the Centre for Oral Health Sciences in Malmö, Sweden. Six children never appeared; four did not show up in spite of repeated notices, one was treated in a private practice, and one child received orthodontic treatment and therefore voluntarily refrained from other examination. All other patients (n = 99; age range 4 to 19 years; 27 boys, 72 girls) took part in the study (Fig 1). The patients had been referred from both dentists and physicians in the city of Malmö and surroundings. The 99 children and young adults were examined and treated by eight dentists at the Department of Stomatognathic Physiology.

Data from the patient records used in the department were collected for this retrospective study. The examination of the stomatognathic system had been performed according to methods routinely used in the department,<sup>24</sup> and information concerning kind, frequency, and duration of symptoms had been collected. Mandibular mobility, pain in the masticatory muscles on palpation, TMJ pain on palpation, and TMJ sounds were recorded. Pain in the masticatory muscles was graded according to the following scale: 0 = no tenderness; 1 = the subject could feel a slight tenderness but no obvious pain reaction was evoked; 2 = the pain gave rise to a palpebral reflex; 3 = the pain gave rise to a protective reflex. Pain on palpation of the TMJ was recorded if the subject could feel any kind of pain. Temporomandibular joint sounds were recorded if they were palpable or audible without a stethoscope. Overjet, overbite,

lateral displacement of the mandible between retruded contact position (RCP) and intercuspal position (ICP), mediotrusion interferences, occlusal sagittal relationship, open bite, and deep bite were also registered during the clinical examination. Patients were classified using Helkimo's anamnestic and clinical dysfunction indices.<sup>25</sup>

Diagnoses were made according to the World Health Organization (WHO) classifications<sup>26</sup> and noted at the examination. Information on the different treatment modalities and the length of treatment were registered from the patients' records. The evaluation of treatment outcome was made by measuring the subjective symptoms before and after treatment using the following verbal scale: 1 = no or minimal discomfort; 2 = slight discomfort; 3 = moderate discomfort; 4 = severe discomfort; 5 = very severe discomfort. According to the records, some patients had not graded their symptoms before and/or after treatment. Information about some patients' symptoms was obtained by telephone. In some cases, missing data made it impossible to evaluate variables, which also explains the different number of patients in the analyses. (Consequently, we present the actual number of patients for those variables that were not registered in all the records.)

## Results

### Symptoms

The patients reported various symptoms at the first examination, eg, headache, facial pain, pain during chewing and opening the mouth wide, TMJ



sounds, tiredness in the jaws, and locking of the TMJ (Table 1). In individuals with a recorded duration of headache and facial pain ( $n = 25$ ), 80% and 70% had suffered for more than 6 months.

According to Helkimo's anamnestic dysfunction index, 10% of the individuals belonged to A.0, 21% to A.I, and 69% to A.II. It was not possible to classify 10% of the patients.

## Signs

An average maximal opening capacity of 46.3 mm was found in the 75 persons measured for this sign. Ten individuals (13%) had an opening capacity of less than 40 mm. Laterotrusion and mediotrusion were measured in 66 persons; the means for maximal laterotrusion to the right and left were 10.1 mm and 9.9 mm, and the mean maximal protrusion was 8.4 mm (Table 2). One of these mandibular movements was restricted (less than 6 mm) in five individuals (7%). Of the 67 persons in whom records were made, at least one painful movement was registered in 39 (58%). Pain at maximal opening was the most common painful movement and present in 30 individuals (45%).

A total of 91% of the 70 children and young adults tested exhibited pain on palpation in the masticatory muscles; tenderness was shown according to grade 2 and/or 3 in 38% and according to grade 1 in 53%. The most common muscle sites to be tender to palpation were the insertion of the temporal muscle (41%) and the superficial masseter muscle (37%). The anterior part of the temporal muscle showed tenderness to palpation in 24% of the children and young adults.

One of the most common signs from the TMJ was clicking sounds, which were present in 51% of the 78 persons tested for this sign. Crepitation was registered in 1 person. Tenderness on lateral palpation of the TMJ was more frequent (37%) than tenderness to posterior palpation (20%) (Table 3).

The occlusal parameters in those tested for overjet ( $n = 65$ ) and overbite ( $n = 67$ ) were on average 3.5 mm (range 0 to 10 mm) and 3.2 mm (range -2.5 to 7.5 mm). In 31% of the 65 persons tested, a lateral displacement ( $\geq 0.5$  mm) of the mandible between RCP and ICP was found. Mediotrusion interference was noted in 40% of the 63 individuals tested for this sign.

The occlusal sagittal relationship was measured in 67 children and young adults, 64% of whom showed a normal relationship, 31% of whom

**Table 1** Distribution of Symptoms in a Group of Children and Young Adults Referred for Treatment of CMD ( $n = 99$ )

Symptoms	Frequency (%)
Headache	52
TMJ clickings	49
Pain at chewing	47
Pain at opening wide	46
Facial pain	40
TMJ lockings	31
Tiredness in the jaws	24

**Table 2** Mean Values (SD) and Range of Variation (mm) for Mandibular Mobility in Children and Young Adults Treated for CMD

Mandibular movement	Mean (SD)	Range
Maximal opening capacity*	46.3 (8.8)	22-68
Laterotrusion right†	10.1 (2.2)	3-15
Laterotrusion left†	9.9 (2.2)	5-15
Protrusion†	8.4 (2.1)	3-12

\*N = 75.

†N = 66.

**Table 3** Distribution of TMJ Pain at Palpation and TMJ Sounds Among Children and Young Adults Referred for Treatment of CMD

TMJ Signs	Frequency n (%)
Lateral tenderness*	18 (24)
Posterior tenderness*	5 (7)
Lateral and posterior tenderness*	10 (13)
TMJ clicking†	40 (51)
Crepitation†	1 (1)

\*N = 76.

†N = 78.

showed a postnormal relationship, and 5% of whom showed a prenatal relationship. Frontal open bite was registered in 19% and frontal deep bite in 27% of the 68 patients examined for these signs.

The percentage distribution of the 99 children and adolescents according to Helkimo's dysfunction index was: D.0 = 6%; D.I = 42%; D.II = 19%; and D.III = 33%.

## Diagnoses

Distribution of patients by WHO diagnoses is shown in Table 4. The most common diagnosis was anterior disc displacement (32%). This was a clinical diagnosis that was ascribed when a reciprocal clicking was palpated or auscultated in the opening and closing movements,<sup>27</sup> but not in the same position of the mandibular movements.<sup>28</sup> Arthrography was performed on three patients, which verified the clinical diagnosis. In the group with the diagnosis of anterior disc displacement, only eight individuals presented tenderness to palpation over the TMJ. Craniomandibular disor-

**Table 4** Distribution of Diagnoses Registered at Examinations of Children and Young Adults Referred for Treatment of CMD (n = 99)

ICD-DA classification code	Diagnoses	Frequency (%)
718.38	Anterior disc displacement	32
524.60	Craniomandibular disorders of muscular origin	16
781.00	Bruxism	10
716.18	Traumatic arthritis	9
718.28	Anterior disc displacement closed lock	9
307.09	Tension headache	8
719.48	Microtraumatic arthritis	6
729.0 x	Fibrositis	3
524.4 x	Malocclusion	2
714.38	Rheumatoid arthritis	1
696.10	Psoriatic arthritis	1
-	No diagnosis	3

ders of muscular origin were found in 16% of the group. The clinical diagnosis of anterior disc displacement closed lock<sup>28</sup> was found in 9% of the patients and verified by arthrography in three patients. In the referrals, diagnoses were suggested in only 38% of the 99 patients, and the most common one was bruxism.

## Treatment

The treatment modalities applied were information, counselling, splints, occlusal adjustment, exercises for the mandible, medication, biofeedback, orthodontic treatment, physiotherapy, intraarticular injection, and surgery (Table 5). All patients were given information and counselling and in 15% of them this was sufficient therapy. Splints were made in 72% of the children and young adults, stabilizing splints in 67%, and inactive activators in 5%<sup>29</sup> (Figs 2a and 2b).

## Treatment outcome

Of the 88 patients for whom this information was gathered, 91% reported that they were better or symptom-free from 1 month up to 2 years and 7 months after the treatment. Evaluation of the subjective symptoms before and after treatment in 74 patients is shown in Table 6. A statistically significant difference was found between the evaluation of symptoms before and after treatment (Wilcoxon's signed test,  $z = 6,842$ ,  $P < .001$ ). On average, the children and young adults needed 4.7 visits and required a treatment period of 9.1 months. When numbers of visits and treatment lengths were correlated with the patients' grading

**Table 5** Distribution of Diagnoses vs Treatment Modalities in Children and Young Adults Treated for CMD (n = 99)

Treatment modality	Diagnosis											Total	
	ADD	CMD	ADDCL	TA	BR	TH	MA	FIB	MAL	RA	PA		ND
Occlusal splints	20	13	6	4	7	7	3	3	1				64
Occlusal adjustment	5	6	2		2	1	2	3	2				23
Exercise for the mandible	6	4	3	2	1	1	2						19
Info and counselling only	4		2	2	1	1	1			1	1	3	16
Medication	1	1	2	7									11
Biofeedback		5			1	1	1	1					9
Orthodontics	3	2	2			1			1				9
Physiotherapy		1				1							2
Surgery			1										1

ADD = Anterior disc displacement  
 CMD = Craniomandibular disorders  
 ADDCL = Anterior disc displacement closed lock  
 TA = Traumatic arthritis

BR = Bruxism  
 TH = Tension headache  
 MA = Microtraumatic arthritis  
 FIB = Fibrositis

MAL = Malocclusion  
 RA = Rheumatoid arthritis  
 PA = Psoriatic arthritis  
 ND = No diagnosis





Fig 2a Inactive activator and splint used for mixed dentition.



Fig 2b Frontal view of inactive activator in situ.

Table 6 Cross Tabulation of Evaluation of Subjective Symptoms (According to the Verbal Scale: 1 = None or Minimal Discomfort; 2 = Slight Discomfort; 3 = Moderate Discomfort; 4 = Severe Discomfort; and 5 = Very Severe Discomfort)\*

Subjective evaluation after treatment	Subjective evaluation before treatment					Total
	1	2	3	4	5	
1	7	12	13	8	5	45
2	1	0	3	6	3	13
3	0	1	4	6	1	12
4	0	0	1	2	1	4
5	0	0	0	0	0	0
Total	8	13	21	22	10	74

\*N = 74; Wilcoxon's signed test  $z = 6.842$  and  $P < .001$ .

Table 7 Treatment Length and Numbers and Patient's (n = 63) Evaluation of Symptoms (Verbal Scale as in Table 6)

Treatment length	No. of patients with	
	minimal/moderate symptoms (1-3)	severe/very severe symptoms (4-5)
< 6 months	15	5
> 6 months	20	23
1-5 visits	21	11
> 6 visits	14	17

of their symptoms, patients with severe and very severe symptoms needed statistically significantly longer treatment periods (chi-square test,  $\chi^2 = 4.49$ ,  $P < .05$ ) and more visits (chi-square test,  $\chi^2 = 4.27$ ,  $P < .05$ ) than did patients with minimal, slight, and moderate symptoms (Table 7).

The most common diagnosis in patients who got worse or did not improve after treatment (Table 8) was anterior disc displacement (73%).

## Discussion

This group of children and young adults represented 9% of the total number of patients treated during the years 1987 and 1988 at the Centre for Oral Health Sciences in Malmö, Sweden. Of the total sample of referred children and young adults, only six patients did not participate in this test. As these patients have been selected over 2 years, the group

**Table 8** Patients (n = 88) Who did not Improve After Treatment and Their Evaluation of Symptoms (Verbal Scale: 1 = None or Minimal Discomfort; 2 = Slight Discomfort; 3 = Moderate Discomfort; 4 = Severe Discomfort; 5 = Very Severe Discomfort)

Patient no.	Evaluation of Symptoms			Diagnosis
	Before treatment	After 1-11 months	After ≥ 1 year	
1	3	3	-	ADD
2	4	4	3	ADD
3	3	3	2	ADD
4	2	3	-	TA
5	3	3	2	MAL
6	3	4	4	TH
7	3	3	-	ADD CL
8	4	4	4	ADD
9	4	-	4	ADD
10	3	1	3	ADD
11	2	-	2	ADD CL

ADD = anterior disc displacement

TA = traumatic arthritis

MAL = malocclusion

ADD CL = anterior disc displacement closed lock

TH = tension headache

- = unknown

could be considered to present the range of young patients' diagnoses, symptoms, and signs. The overrepresentation of girls in this group of CMD patients reflects that which has been presented in earlier studies,<sup>21,23,30</sup> although epidemiologic studies have not shown any differences in sex distribution with regard to symptoms and signs of CMD.<sup>31</sup>

The methods used to obtain a diagnosis included an interview combined with a clinical examination. The examination technique has been used at the department for a long time, and attempts to evaluate the errors of this method have been presented previously.<sup>32,33</sup> The children were examined by eight dentists, but the different examination techniques included in the study have not been taken into consideration.

Among the symptoms found in the children and young adults, headaches were common. This has also been reported as a common symptom in clinical studies on young people.<sup>21,30</sup> Although headache is not included in the Helkimo's anamnestic index,<sup>25</sup> 62% of the youngsters were classified as A.II.

Among the clinical signs, a restricted opening capacity was found in 15% of the patients, which is nearly the same prevalence as the one found by Magnusson et al.<sup>23</sup> A common sign was tenderness

to palpation of the masticatory muscles, which is also reported by Ingerslev<sup>21</sup> and Magnusson et al.<sup>23</sup> The most common muscles tender to palpation were the temporal and the masseter muscles, which are obviously the muscles that need to be palpated in children and young adults to evaluate the possible involvement of the musculature in CMD. Clicking sounds were found in 51% of the individuals and reported as symptoms in 49%. The high prevalence in this group of patients corresponds with figures from other patient groups.<sup>21,23,30</sup> When the occlusal sagittal relationship was evaluated, the postnormal relationship was found in a relatively high proportion of cases in this patient group (31%) compared to results from epidemiologic studies (6% to 21%).<sup>2,3,31</sup>

The proportion of children and young adults (33%) in whom the dysfunction index according to Helkimo was high (D.III) even in comparison to the proportion of adult patients reported in this category (27% to 40%).<sup>34,35</sup>

There was a high prevalence of anterior disc displacement according to WHO diagnosis classifications. This diagnosis was mainly clinical, as only three cases were verified with arthrography; however, reciprocal clicking has been shown to be highly indicative for a reducing disc, and a routine use of expensive imaging methods is not realistic.<sup>36</sup> Among the patients with this diagnosis, only 26% had tenderness to palpation over their TMJs and 55% had muscles tender to palpation, which could mean that the patients' disorders were mainly of muscular origin despite a reciprocal clicking having been diagnosed.

After treatment, 91% of the 88 children and young adults for whom this information was gathered reported themselves to be better or symptom free. This result is well in accordance with an earlier report.<sup>30</sup> It is not possible to assess if this is an exclusive result of the treatment in a retrospective study. For such an assessment, a prospective study including a control group would have been necessary, which would be difficult from an ethical point of view. Several young people in this study had suffered from their symptoms for more than 6 months without healing by themselves and were successfully treated with these conservative methods; one child needed surgery (extirpation of the left TMJ disc).

Among the children who did not improve after treatment, the diagnoses of anterior disc displacement and/or anterior disc displacement closed lock were found in 73% of the patients, but the initial proportion of children and young adults with this diagnoses was 41%. Although there was a high



percentage of patients with these diagnoses in the group that did not improve after treatment, the percentage of the total number of patients with these diagnoses that did not improve was 25% (8/32), which corresponds to the percentage of treatment failures in adults (20% to 27%).<sup>32,37</sup>

As for treatment modalities, it is obvious that the occlusal splint is the one most commonly used. However, the fact that 17% of the youngsters needed only information and counselling as treatment should not be ignored.

The figures in this study do not reveal anything about the treatment need or demand in a population of children and young adults. The need and/or demand for treatment have been suggested to be low.<sup>23</sup> When there is a need for treatment, however, it seems that conservative methods can give a good treatment outcome in these younger age groups.

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## Resumen

### Desórdenes Craneomandibulares en Niños y Adultos Jóvenes: Tratamiento y Resultados

En este estudio se evaluaron retrospectivamente los síntomas, signos, diagnósticos, tratamiento y resultados del tratamiento; pertenecientes a un grupo de 99 niños y adultos jóvenes referidos a un centro de ciencias de la salud oral sueco. Los síntomas más comunes en estos pacientes fueron las cefaleas (52%), los sonidos de click en la articulación temporomandibular (41%), el dolor durante la masticación (47%), y el dolor durante la apertura bucal amplia (46%). Los diagnósticos comunes fueron: el desplazamiento del disco anterior (32%), y los desórdenes craneomandibulares de origen muscular (16%). El tratamiento a base de férulas oclusales, fué una modalidad terapéutica comúnmente utilizada. Después del tratamiento, el 91% de los niños y adultos jóvenes manifestaron que se sentían mejor ó que no tenían síntomas. Se concluyó que el uso de métodos de tratamiento conservativos trajo buenos resultados en este grupo de pacientes.

## Zusammenfassung

### Behandlung und Resultate von Kindern und jungen Erwachsenen mit Myoarthropathien des Kausystems

Eine Gruppe von 99 Kindern und jungen Erwachsenen aus einem schwedischen Zentrum wurde retrospektiv bezüglich Symptomen, Zeichen, Diagnosen, Behandlungen und Resultaten ausgewertet. Die häufigsten Symptome dieser Gruppe von Patienten waren Kopfschmerzen (52%), Kiefergelenkknacken (41%), Schmerzen beim Kauen (47%) und Schmerzen bei weiter Mundöffnung (46%). Die häufigsten zwei Diagnosen waren anteriore Diskusverlagerung (32%) und Kaufunktionsstörungen muskulären Ursprungs (16%). Die Aufbisschiene war das am häufigsten eingesetzte Therapiemittel. Nach der Behandlung berichteten 91% der Patienten über eine Verbesserung der Symptomatik resp. Symptombefreiheit. In dieser Patientengruppe konnten mit konservativen Behandlungsmethoden gute Ergebnisse erzielt werden.

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