Head posture and dentofacial asymmetries in surgically treated muscular torticollis patients

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Muscular torticollis is a medically well-known condition that is usually diagnosed in early childhood and in which early surgical intervention is recommended to prevent the development of facial asymmetries. The purpose of this study is to examine head posture and possible dentofacial asymmetries in patients who have undergone surgical treatment for muscular torticollis in early childhood. Natural head position roentgenograms were taken in frontal projection, a clinical examination of oral status was performed, and dental casts were made. Marked craniofacial and dental asymmetries were observed, combined with a deviant head posture, in spite of surgical treatment for muscular torticollis earlier in childhood. □ *Clinical study; craniofacial assymmetry; sternomastoid muscle; surgical corrections*

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Muscular torticollis, the etiology of which still remains partly obscure, is medically well known and easily diagnosed, usually during early childhood. Of the different methods proposed for treating this condition, early surgical intervention has been recommended to prevent the development of facial asymmetries (1, 2). The outcome of surgical treatment is usually evaluated by reference to subjective observations of facial asymmetries and head tilt (1, 3, 4). However, no cephalometric studies of head position or facial asymmetries have been carried out, nor have the possible late effects of dental occlusion been studied.

The purpose of the present work was to examine head posture and possible asymmetries of the facial skeleton and dental arches in patients who had undergone surgical treatment for muscular torticollis in early childhood.

Subjects and methods

The series comprised 16 patients (12 females and 4 males), aged 7 to 22 years, who had been treated surgically at Oulu University Central Hospital by division or resection of the sternomastoid muscle in early childhood. The control group for the cephalometric evaluation comprised 21 students (19 women and 2 men) aged 21 to 27 years, and that for the dental arch evaluation an age- and sex-matched sample of healthy subjects with no previous orthodontic treatment. Natural head position roentgenograms were taken in frontal projection by a method described by Huggare (J. Huggare. Unpublished observations). The roentgenograms were analyzed with regard to head tilt and facial asymmetry by means of several reference points and lines (Figs. 1 and 2) and defined verbally (Table 1). The first 10 roentgenograms were traced twice by the same author at an interval of 1 month, and the intra-examiner error was calculated from the formula

$$s(i) = \sqrt{\frac{\sum(d^1 - d^2)^2}{2n}}$$

where $d^1 - d^2$ is the difference between the repeated measurements for each angle.

A clinical examination of oral status was performed by two experienced orthodontists, dental casts were made, and any earlier orthodontic treatment was docu-

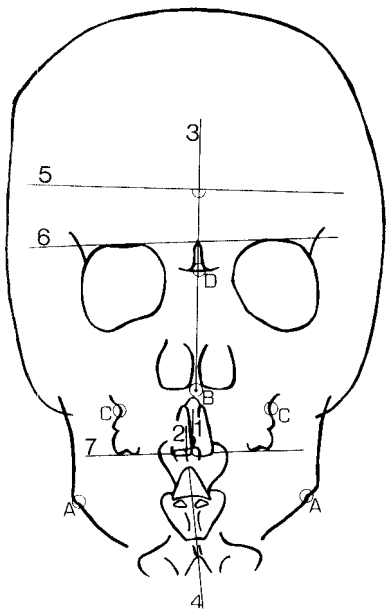

Fig. 1. Reference points and lines on natural head position posteroanterior roentgenograms.

Table 1. Reference points and lines on natural head position posteroanterior roentgenograms

Reference point	
A	Antegonion, highest point in the antegonial notch of the mandible
B	Anterior nasal spine
C	Deepest point of maxillary tuberosity in the frontal plane
D	Point of intersection between the crista galli midline and the anterior skull base line
Reference line	
1	Interincisal line of the maxilla, indicates the contact line (midline) between the maxillary central incisors
2	Interincisal line of the mandible, indicates the contact line (midline) between the mandibular central incisors
3	Cranial central line, line drawn through the crista galli and anterior nasal spine
4	Cervical line, line indicating the course of the cervical spine
5	Cranial horizontal line, the line perpendicular to the cranial central line
6	Orbital plane, tangent to the extreme cranial point on the supraorbital margins
7	Maxillary occlusal plane, tangent to the extreme inferior cusps of the molars of the maxilla

mented. In the torticollis group four persons had been treated orthodontically to correct lateral malocclusions by expansion or cross-elastics. In the control group used for facial asymmetry study four persons had been treated orthodontically owing to dental crowding, and two lateral malocclusions had been diagnosed but left untreated. Dental arch asymmetries were studied by measuring the bilateral difference in the distances from the interincisal point to the canines, bicuspids and molars. The distances were measured from the highest point of the mesiolingual cusp in the case of the molars and the highest point of the lingual cusp in the bicuspids (Fig. 3). Asymmetry was calculated from the formula

$$d = \frac{\sum |a_i - b_i|}{n_i}$$

where n_i is the number of bilateral teeth measured in one dental arch. The methodologic error was calculated by means of the same formula as above.

The statistical significance of differences between groups was tested with Student's *t* test, and the significance of the differences

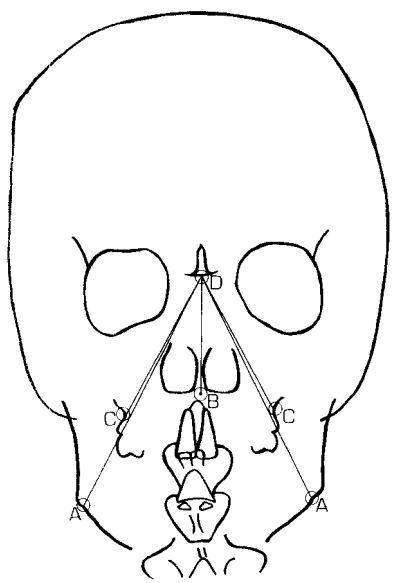

Fig. 2. Angles used in triangle analysis. CDB angles on the left and right sides were compared in the maxillary analysis and ADB angles on the left and right sides in the mandibular analysis.

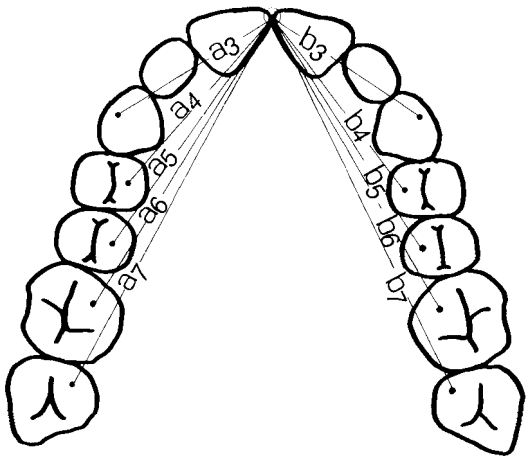

Fig. 3. Bilateral distance between the interincisal point and the canines, cuspids, and molars.

in the prevalence of malocclusions by means of Fisher's exact test.

Results

The methodologic error, measured in terms of reproducibility, ranged from 0.4° to 0.9° in the cephalometric angles and was 0.8% in the dental arch analysis.

The head was more tilted in the muscular torticollis patients than in the control group, as the craniovertical angle and the craniocervical angle (angle between the cranial central line and the cervical spine line) were increased. Moreover, the maxillary occlusal plane was rotated further with regard to the cranial horizontal line, the direction being the opposite to that of the head tilt, and the orbital plane had more often shifted with regard to the cranial horizontal line. There was more maxillary midline deviation in the patients than in the controls, but there was no significant difference between the groups with regard to mandibular midline deviation (Table 2).

Study of the maxillary halves by triangle analysis (5) showed the maxilla to have shifted in the direction of head tilt in the muscular torticollis cases, the degree of shift correlating with the extent of head tilt ($t = 1.98$, $p \leq 0.05$). The patients did not, however, differ significantly from their controls in terms of asymmetry of the mandibular halves.

Correspondingly, there was more asymmetry in the maxillary dental arch in the patients than in the controls, whereas no significant difference was observed in the mandibular arches (Table 3).

Significantly more scissors bites and crossbites were diagnosed or treated earlier in the patients than in the control group (Table 4), and the prevalence of lateral malocclusions in the former correlated with the degree of head tilt (Table 5).

Table 2. Variables (in degrees) for head position and asymmetries in treated torticollis patients ($n = 16$) and healthy controls ($n = 21$)

	Patients		Controls		
	$\bar{x}$	SD	$\bar{x}$	SD	t value
1. Craniovertical angle	2.8	1.53	1.3	1.45	3.10**
2. Craniocervical angle	3.6	2.45	2.3	1.52	2.05*
3. Orbital plane–cranial horizontal line	2.7	1.30	1.5	0.91	3.24**
4. Maxillary occlusal plane–cranial horizontal line	2.2	1.38	0.9	0.77	3.67**
5. Maxillary midline–cranial central line	1.7	1.27	1.0	1.05	2.04*
6. Mandibular midline–cranial central line	1.9	1.09	1.5	0.99	1.13 NS

* $p < 0.05$.
** $p < 0.01$.

Table 3. Dental arch asymmetry, measured as the bilateral difference in distance between the interincisal point and the canines, bicuspids, and molars

	Study group (n = 16)		Control group (n = 16)		
	$\bar{x}$	SD	$\bar{x}$	SD	t
Maxillary arch	1.0	0.84	0.6	0.36	1.73*
Mandibular arch	0.8	0.71	0.6	0.41	NS

* $p < 0.05$.

Discussion

In spite of the surgical treatment of muscular torticollis in early childhood, the head position was more tilted than in the control group, and significant asymmetries of the facial skeleton and dental arches were also found. Previous posttreatment studies of muscular torticollis record subjective observations of facial asymmetry and head position but do not provide any numerical head position data (1, 3, 4).

The method used for recording natural head position in this study has been found to be accurate (J. Huggare. Unpublished observations). The lines and points used in the cephalometric analysis were chosen to minimize the errors mentioned in previous examinations of facial asymmetries in the frontal projection (6,7). For ethical reasons it was not possible to use age-matched cephalometric controls, but this is not likely to have influenced the results, since craniofacial asymmetry does not generally decrease during growth (8).

There was more deviation in the craniovertical angle in the muscular torticollis patients than in the controls, and from a clinical point of view it may be important to note that the extent of deviation in the former correlated with the prevalence of lateral malocclusions.

The patients had a high prevalence of treated or diagnosed lateral malocclusions (50%) compared with the control group (12.5%). The prevalence of lateral malocclusions in the control group corresponds with that reported for 7-year-olds by Heikinheimo (9) and Hannuksela (10) but is considerably higher than that of Myllärniemi (11). The patients also had more dental arch asymmetry and midline deviation in the maxillary arch than in the mandibular arch, which is in accordance with previous studies on dental arches, which have similarly shown more asymmetry in the maxilla than in the mandible (12, 13).

The conclusion is that routine dental examination in cases of suspected deviant head posture should include an evaluation of natural head position in the frontal plane, and proper treatment at an early age should be recommended for any condition affecting normal head balance.

Table 4. Prevalence of lateral malocclusions in the muscular torticollis patients (n = 16) and controls (n = 16)

	Study group	Control group
Diagnosed or treated scissors or cross-bites	8 (50%)	2 (12.5%)*
Normal lateral occlusion	8 (50%)	14 (87.5%)*

* $p < 0.05$, Fisher's exact test.

Table 5. Degree of head tilt in the study group in relation to lateral malocclusions

	Craniovertical angle		
	$\bar{x}$	SD	t value
Diagnosed or treated scissors or crossbites (n = 8)	3.5	1.79	1.97*
Normal lateral occlusion (n = 8)	2.1	0.83	

* $p < 0.05$.

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