

THE CORRELATION BETWEEN PREPUBERTAL TRAUMA AND MANDIBULAR ASYMMETRY IN ORTHOGNATHIC SURGERY AND ORTHODONTIC PATIENTS

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REZUMAT

Interrelația între evidența clinică și radiografică a unei asimetrii mandibulare și existența în antecedentele personale a unui traumatism a fost analizată comparativ la două loturi de pacienți, evidențiindu-se o asociere statistic semnificativă între acești doi parametri. Rezultatele sugerează faptul că traumatismele prepubertare reprezintă un factor etiologic semnificativ în dezvoltarea ulterioară a unei asimetrii mandibulare.

Cuvinte cheie: traumatism facial prepubertar, pacienți ortodontici, pacienți ortodontic-chirurgicali, asimetrie mandibulară

ABSTRACT

The association between radiographic evidence of mandibular asymmetry and history of prepubertal trauma was analyzed in orthognathic surgery patients and orthodontic patients. There were statistically significant associations between radiographic evidence of mandibular asymmetry and a history of prepubertal trauma in both patient groups. The results suggest that prepubertal trauma could be one etiologic factor for the development of mandibular asymmetry.

Key Words: prepubertal trauma, orthodontic patients, orthognathic surgery patients, mandibular asymmetry

INTRODUCTION

Facial asymmetry is a common finding during a clinical or radiographic examination and it is usually not associated with evident esthetic or functional significance, being important only when affecting the function or esthetics of the person. Asymmetry of the mandible is usually clinically characterized by one or several of the following features: deviation of the chin to one side, dentoskeletal midline discrepancies, crossbite, and vertical discrepancies of the mandible, limitation of movements and canting of the occlusal plane.

The etiology of the mandibular asymmetry includes condylar hyperplasia or hypoplasia, condylar fractures, temporomandibular joint ankylosis, tumors of the temporomandibular joint region and intraarticular disorders, such as internal derangement associated with arthrosis or inflammatory arthritis.¹⁻³

The objective of this study was to determine the possible association between prepubertal trauma to the face and mandibular asymmetry, by analyzing data from the records of patients undergoing orthognathic surgery or orthodontic treatment.

MATERIAL AND METHOD

The study examined two patient groups, one consisting of 56 orthognathic surgery patients (first study group) and the second of 109 orthodontic patients (second study group).

The orthognathic surgery group comprised a series of patients treated by the same orthodontist (C.C.). The orthodontic patients were randomly selected from previous orthodontic patients in the Department of Orthodontics of the Eberhard-Karls University, Tübingen, Germany. The initial orthodontic sample included 159 patients. Of these, 29 were

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eliminated because of incomplete data or radiographic evidence of head rotation, yielding a final sample of 109 patients.

All records contained a complete medical and dental history and a detailed history with both positive and negative answers concerning trauma to the face or jaws.⁴

Prepubertal trauma was defined as significant trauma to the maxillofacial region and a simple trauma to the cranium was not included unless there was simultaneous trauma to the maxillofacial region. When mentioned, the prepubertal trauma has been detailed about the region, intensity, diagnosis and treatment.⁵

In the orthognathic surgery group, there were 21 males and 35 females. The mean age was 23 years, (range 13 to 47 years). In the orthodontic treatment group the mean age was 17 years (range 9 to 47 years).

Postero-anterior cephalometric radiographs were available for all patients. The radiographs were obtained according to a method described by Proffit.⁶⁻⁹ The mandibular position is registered when the first contact occurs between the upper and lower teeth before the patient reached full centric occlusion, in order to demonstrate the skeletal relationship of the mandible to the rest of the facial skeleton without guided deflections that may occur in patients with malocclusions in full centric occlusion.

Table 1. Types of prepubertal trauma (reported by orthognathic surgery patients and orthodontic patients).

Types of Trauma	Orthognath surgery patients N=56	Orthodontic patients N=109	Age at the time of trauma Mean	Range of age at the time of trauma
Trauma to the chin, mandible, or maxilla not requiring surgical intervention	4 (7.14%)	8 (7.33%)	5	2-9
Trauma resulting in fracture of condyle or condylar neck (documented radiographically)	1 (1.76%)	2 (1.84%)	6	3-8
Trauma to the mandible requiring suturing of the skin	0	3 (2.75%)	8	7-9
Repeated trauma secondary to abuse	1 (1.76%)	0	4	9-47
Falls resulting in trauma to mandible not requiring suturing of skin	0	2 (1.84%)	9	8-11
Falls resulting in trauma to mandible requiring suturing of skin	0	2 (1.84%)	3	2-5
Unilateral trauma	0	2 (1.84%)	8	5-10
Trauma to mandible resulting in evulsion of all anterior teeth	0	1 (0.91%)	5	9-47
Total number of trauma	6 (10.71%)	20 (18.34%)		

The radiographs were observed for the possibility of head rotation. The distance from the tip of the mastoid process to the midsagittal plane was evaluated to exclude cases with side-to-side differences resulting from head rotation. When there was evidence of a side-to-side difference suggesting head rotation, these cases were excluded from analysis, as previously described.

The horizontal reference plane was the bipupilar plane. The vertical reference plane connecting the center of crista galli and the center of the anterior nasal spine was constructed and extended to the lower border of the mandible. This line, defining the midsagittal plane of the face and its intersection with the inferior border of the mandible, was then connected to the inferior gonial points in the right and left side with two lines.⁹⁻¹¹

The lengths of these two lines were measured and a difference of 3.0 mm or more was defined as mandibular asymmetry. The findings were analyzed with Fishers Exact Test, a p value of less than 0.05 was considered statistically significant.

RESULTS

According to the patient answers, in the orthognathic patients group, prepubertal trauma to the face was registered in six patients, all of whom presented with mandibular asymmetry. In the orthodontic group 20 patients had a history of trauma, 11 of whom had mandibular asymmetry. (Table 1)

There was a statistically significant association between a history of prepubertal trauma and radiographic evidence of mandibular asymmetry as measured on the posterior anterior radiographs in both the orthognathic surgery and orthodontic patients. (Tables 2,3)

Table 2. Association between prepubertal trauma and mandibular asymmetry reported by orthognathic surgery patients.

	Mandibular asymmetry	No asymmetry	Total
No prepubertal trauma	17 (30.35%)	33 (58.92%)	50 (89.28%)
Prepubertal trauma	6 (10.71%)	0	6 (10.71%)
Total	23 (41.07%)	33 (58.92%)	56

Fishers Exact Test: $p < 0.008$

Table 3. Association between prepubertal trauma and mandibular asymmetry reported by orthodontic patients.

	Mandibular asymmetry	No asymmetry	Total
No prepubertal trauma	21 (19.26%)	68 (62.38%)	89 (81.65%)
Prepubertal trauma	11 (10.09%)	9 (8.25%)	20 (18.35%)
Total	32 (29.35%)	77 (70.64%)	109

Fishers Exact Test: $p < 0.002$

DISCUSSION

Facial asymmetry is the result of variations in the growth potential of the mandible, the structural form and shape of the bone being influenced genetical factors and musculature.^{10,11}

The entire ramus plays a key role in the development of the facial skeleton, and it has together with the mandibular condyle the ability of morphogenic adaptation.^{12,13} Compensatory response to an injury may lead to an imbalance of growth in the condyle and the ramus as a whole, the physiologic status of the condylar cartilage being greatly influenced by the extrinsic factors resulting from the functional activity of the masticatory muscles.^{14,15} The condylar cartilage is considered a secondary adaptive and remodeling growth site. Thus the condylar process is particularly vulnerable to environmental and genetic influences which lead to various unilateral or bilateral disturbances in growth.¹⁶

The findings in this study suggest an association between pre-pubertal trauma to the facial skeleton and mandibular asymmetry in patients undergoing orthognathic surgery or orthodontic treatment of

41% and 29% respectively.

Previous studies conducted by Profitt , Luz, Edler et al. suggest the prepubertal trauma of the face or jaws to be an important cause for a subsequent mandibular asymmetry, developed during growth.¹⁷

The results of our study are similar to those related by Schellhas after analyzing 100 orthodontically treated patients. His findings demonstrate a frequency of the mandibular asymmetry of 47% after a trauma of the TMJ joint. Williamson also reported a frequency of mandibular asymmetries of 62% in a group of patients with muscular disfunctions.⁵

CONCLUSIONS

1. Mandibular asymmetry has been more frequently observed in the orthognathic surgery patients group (41.07%) than in orthodontic patients group (29.35%).

2. The significant statistic association between the mandibular asymmetry and a previous prepubertal trauma has been reported in both study groups.

3. The posteroanterior cephalometric radiograph method eliminates all the errors of the conventional methods, when the radiographic registration has been obtained in centric occlusion, permitting a clear evidence of an existing mandibular asymmetry.

4. Prepubertal trauma is an important cause of a subsequent mandibular asymmetry.

5. Due to the increased frequency of mandibular asymmetry, clinical and computerized assesment of the patients with a history of prepubertal trauma is essential for a strict schedule of the type of treatment.

6. Early orthodontic treatment of patients with a prepubertal trauma significantly reduces the need for orthognathic surgery.

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