International Orthopaedics (SICOT) (1991) 15: 57–59

International
Orthopaedics

Hereditary orthodontic anomalies and idiopathic scoliosis

M. Pećina[1], O. Lulić-Dukić[2], and A. Pećina-Hrnčević[2]

[1] Department of Orthopaedic Surgery, School of Medicine, University of Zagreb, Yugoslavia
[2] Department of Paediatric Dentistry, School of Dentistry, University of Zagreb, Yugoslavia

Summary. *Our study of 202 patients aged from 7 to 17 years treated for idiopathic scoliosis, and with a Cobb angle from 20° to 50°, showed a higher frequency of hereditary orthodontic anomalies than those in the control group. There was unmistakable evidence that acquired orthodontic anomalies occurred in both groups at the same rate of frequency. Our study demonstrated unequivocally that the detection of hereditary orthodontic anomalies in young children allows the identification of a group of children who have a high risk of developing scoliosis in later years.*

Résumé. *Notre étude de 202 malades, âgés de 7 à 17 ans, traités pour scoliose idiopathique, avec un angle de Cobb de 20° à 50°, montre une plus grande fréquence des anomalies orthodontiques héréditaires que dans un groupe de contrôle. Evidemment les anomalies orthodontiques acquises ont été observées avec la même fréquence dans les deux groupes. Ce travail prouve sans équivoque que la détection des anomalies orthodontiques héréditaires dans le jeune âge permet d'identifier un groupe d'enfants à haut risque de développement d'une scoliose dans les années à venir.*

Introduction

Epidemiological studies of the correlation between oro-facial skeletal anomalies have contributed to an aetiological explanation of the development of scoliosis, and to the early detection of scoliosis based on the discovery of orthodontic anomalies in young children.

Offprint requests to: M. Pećina, Department of Orthopaedic Surgery, Šalata 6, 41 000 Zagreb, Yugoslavia

Various reports have related the occurrence of congenital anomalies of the urogenital and cardiovascular systems to scoliosis [6, 11]. Likewise, the influence of the Milwaukee brace on the development of orthodontic anomalies on children treated for scoliosis has been studied [1, 4].

Ten years ago our group began a study of the correlation between orthodontic anomalies and idiopathic scoliosis [5, 7] and we now report our most relevant findings.

Material and methods

Our study included two test groups and a control group. The first consisted of 202 patients, 173 girls and 29 boys, with an age range from 7 to 17 years. All were treated for scoliosis with Cobb angles from 20° to 50°. The following features were considered: (a) growth, (b) physical development, (c) standing height, (d) sitting height, (e) stage of puberty, and (f) skeletal maturity. When necessary, we used Risser's sign of development of the iliac apophysis. We looked for clinical evidence of orthodontic anomalies and carried out anthropological cephalometry and orthopantomographic analysis. Thirty patients required two-projection craniography and radiographic cephalometry in the course of treatment.

The control group consisted of 640 students, 350 girls and 290 boys, who were selected from 1016 primary and secondary school students in Zagreb. They were aged between 7 and 17 years and showed no signs of spinal deformity or scoliosis on clinical examination, moiré topography and radiography were used in doubtful cases. We used the same growth and development measurement as in the first test group, but excluded the Risser sign. We looked for orthodontic anomalies on clinical examination and anthropological cephalometry. In doubtful cases orthopantomographic analysis was used.

The second test group was made up of 104 children, 76 girls and 28 boys, between the ages of 6 and 17 years. They had a history of treatment for hereditary orthodontic anomalies and were selected from children treated at the Orthodontic Institute of the University of Zagreb. We tried to identify the presence of scoliosis by clinical examination and moiré topography; radiographs were taken when required. There was no need for a second control group because previous screen-

Table 1. The incidence of acquired orthodontic anomalies

Acquired anomalies	Scoliotic children	Control group
Secondary compression	6.9 %	7.3 %
Deep bite	6.4 %	5.7 %
Crossbite	2.9 %	1.4 %
Open bite (dental type)	5.4 %	3.0 %

Table 2. The incidence of hereditary orthodontic anomalies

Hereditary anomalies	Scoliotic children	Control group
Hypodontia	10.0 %	0.8 % HI = 0.0000
Progenia	2.0 %	0.8 % HI = 0.0000
Close bite	13.8 %	5.3 % HI = 0.0001
Primary compression	33.1 %	16.7 % HI = 0.0000

ing established that 1.4% of children in Zagreb had scoliosis with a Cobb angle of over 10° [8].

The separation of orthodontic anomalies into hereditary and acquired was made on the basis of standard orthodontic procedures. We excluded those with doubtful findings or those who had a combination of hereditary and acquired anomalies.

The hereditary anomalies included hypodontia (partial absence of one or more teeth), progenia (abnormal protrusion of the mandible), closed bite (upper frontal teeth overlapping the lower frontal teeth), and primary compression (bunching, overlapping, displacement in various directions, and torsiversion).

The acquired anomalies considered were secondary compression (due to premature loss of lateral milk teeth), deep bite (the frontal maxillary teeth overlapping the mandibular teeth by more than 3 mm), cross bite (malocclusion in which the mandibular teeth are in buccal version to the maxillary teeth), and open bite (absence of contact between frontal maxillary and mandibular teeth).

Results

There was a marked difference in the frequency of orthodontic anomalies in children with idiopathic scoliosis, the first group, compared to the control group. It was also evident that both hereditary and acquired anomalies occurred twice as often in children with idiopathic scoliosis compared to children without spinal deformity. When the frequency of acquired orthodontic anomalies was compared in the test group and the control group, there was no evidence of any significant difference (Table 1).

However, when we considered only hereditary orthodontic anomalies (Table 2), it was clear statistically that such anomalies occurred more often in children with scoliosis, the first group, than in the control group. For example, hypodontia occurred ten times more often in children with scoliosis. We did not find any correlation between orthodontic anomalies and the site of the scoliosis.

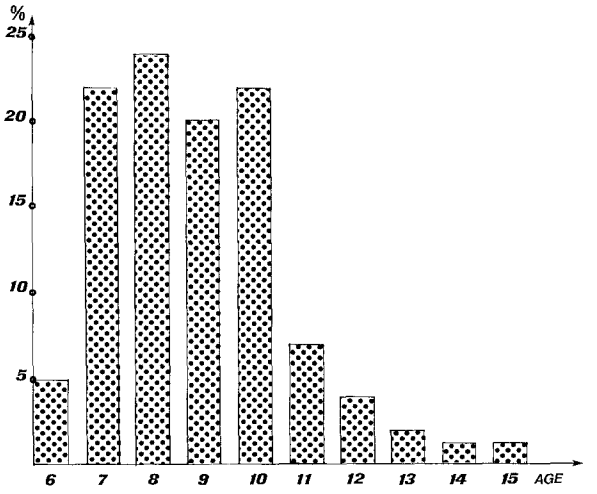

Fig. 1. Age at which hereditary orthodontic anomalies have been detected

In the second test group with hereditary orthodontic anomalies, 58.6% of children had idiopathic structural scoliosis. In children with scoliosis with a Cobb angle of more than 10°, 20.2% had hereditary orthodontic anomalies.

Orthodontic anomalies were most frequently detected in children from 6 to 10 years old (Fig. 1). The same children in whom scoliosis was detected later were aged in most cases between 10 and 13 years (Fig. 2).

Discussion

Orthodontic anomalies generally occur in children between the ages of 7 and 12 years and are usually detected before the age of 10 years.

In our country, as well as others in Europe, the use of lip-activated appliances accounts for the earlier discovery of dental anomalies [2, 3, 9, 10]. Treatment is intended to stimulate and/or correct growth and for that purpose the appliance is applied during growth while the second dentition is forming: it is only used later in special cases.

Our finding that 20.2% of children with hereditary orthodontic anomalies have scoliosis with a Cobb angle of 10° or more must be compared with the incidence of 1.4% of children in Zagreb with a similar degree of scoliosis [8].

We have demonstrated a definite relationship between hereditary orthodontic anomalies and idiopathic scoliosis. Now that these orthodontic anomalies are being discovered at an earlier age, we believe that a group of children with a high risk of developing scoliosis in later years can be identified relatively early within this group.

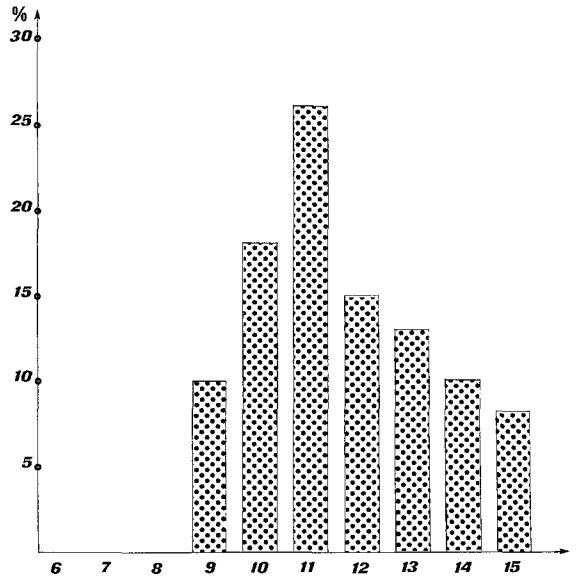

Fig. 2. Age at which scoliosis has been detected

Since idiopathic scoliosis occurs more often in children with hereditary orthodontic anomalies compared to those with acquired anomalies, we recognise that there is a genetic predisposition to the development of idiopathic scoliosis.

Close collaboration between orthopaedic surgeons, orthodontists and paedodontists is essential. Children with hereditary orthodontic anomalies should be seen by an orthopaedic surgeon, and those with more than 10° of scoliosis should be examined by an orthodontist.

References

1. Alexander RG (1966) The effects on tooth position and maxilofacial vertical growth during treatment of scoliosis with the Milwaukee brace. Am J Orthodont 52: 161–168
2. Dausch-Neumann D (1983) Funktionelle Apparate zur Abstellung von Fehlfunktionen bei Kleinkindern. Fortschr Kieferorthop 44: 184–191
3. Ghafari J (1985) A lip-activated appliance in early orthodontic treatment. JADA 111: 771–774
4. Freunthaller P (1967) Zur Vorbeugung von Gebissdeformierungen bei Milwaukeemiederbehandlung. Oest Z Stomat 64: 89–93
5. Lulić-Dukić O, Pećina M, Pećina-Hrnčević A (1983) Orofacial skeleton anomalies in children with idiopathic scoliosis. In: M. Pećina (ed): Scoliosis and Kyphosis. 1st European Congress on Scoliosis and Kyphosis, Dubrovnik 1983, pp 143
6. MacEwen GD, Winter RB, Hardy JH (1972) Evaluation of kidney anomalies in congenital scoliosis. J Bone Joint Surg [Am] 54: 1341–1354
7. Pećina M, Lulić-Dukić O, Pećina-Hrnčević A, Kovač V, Antičević D, Čoklica V (1986) The importance of epidemiological investigations on the correlation between orthodontic anomalies and idiopathic scoliosis. Abstracts Book of European Spinal Deformities Society First Congress, Rome, April 1986, OIC Medical Press, Florence, pp 17
8. Pećina M, Kovač V, Došen D, Antičević D (1984) The possibility of the early detection of scoliosis by moiré topography. Liječ Vjesn 106: 395–401
9. Schlömer R (1984) Der Einfluß des Lutschens und des Beruhigungssaugers auf das Milchgebiß. Fortschr Kieferorthop 45: 141–148
10. Staelens AX (1987) Gebißfehlbildungen bei Kindern zwischen sechs und zwölf Jahren. Fortschr Kieferorthop 48: 94–111
11. Winter RB (1987) Congenital heart disease and scoliosis. Moe's textbook of scoliosis and other spinal deformities, 2nd edn. In: Bradford D, Lonstein J, Moe J, Ogilvie J, Winter R (eds). Saunders, Philadelphia, pp 576–587