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Interrelation Of Orthopedic And Orthodontic Findings From 6-12 Years Of Age: An Original Research

Dr. Deepak Rohella[1] , Dr. Piyush Oswal[2] , Dr Manish Pisarla[3] , Dr. Anuj Paul Maini[4] , Dr. Amrita Das[5] , Dr. Pradeep Kandikatla[6] , Dr. Damarasingu Rajesh[7]

1. *Consultant Orthopedic Surgeon, AMRI Hospital, Bhubaneswar. deepakrohella@gmail.com*
2. *Associate Professor, Dr. D.Y.Patil Dental College And Hospital, Dr.D.Y.Patil Vidyapeeth, Pune. piyush_oswal8@yahoo.co.in*
3. *MDS, Assistant professor, Department of orthodontics and dentofacial orthopaedics, Meghana institute of dental sciences, Nizamabad. manishpisarla@gmail.com*
4. *Professor, Department of Oral Medicine and Radiology, Dr. D. Y. Patil Vidyapeeth, Pimpri, PUNE. mainianuj1976@gmail.com*
5. *Senior lecturer, Department of Periodontology and Implantology, Dr. HSRSM dental college , Hingoli. Maharashtra, India. das.amrita94@gmail.com*
6. *Reader, Dept. of Orthodontics and Dentofacial Orthopaedics, Vishnu Dental College, Bhimavaram, AP. pkandikatla@gmail.com*
7. *OMFS, PhD Scholar, Dept of OMFS, Narsinhbhai Patel Dental College and Hospital, Sankalchand Patel University, Visnagar, Gujarat. rajeshoralsurgeon@gmail.com*

Corresponding Author: Dr. Piyush Oswal, Associate Professor, Dr. D.Y.Patil Dental College And Hospital, Dr.D.Y.Patil Vidyapeeth, Pune. piyush_oswal8@yahoo.co.in

Abstract

Introduction: In order to distinguish between the preventative, diagnostic, and therapeutic sectors of orthopaedics and orthodontics, it is scientifically and practically interesting to examine correlations between orthopaedic and orthodontic data based on multidisciplinary investigations. Numerous research examining the relationships between particular Angle classes and orthopaedic parameters have been published in the literature. The findings of this research suggest a possible relationship between Class II malocclusion and weak body posture as well as scoliosis. The current interdisciplinary study's objectives were to investigate relationships between orthodontic and orthopaedic results in pre-school infants and to assess those relationships in light of preventive advice.

Methodology: In this study, 59 pre-school infants (29 boys and 30 girls) ranging in age from 3.5 to 6.8 years (mean: 5.0 years) were included. The procedure for the orthodontic and orthopaedic examinations was standardized.

Results: Angle class distributions were equivalent to those in non-selected groups according to the orthodontic evaluation (Class I: 63 percent , Class II: 32 percent , Class III: 5 percent). 52 percent of the participants had pathologic findings after the orthopaedic examination, and there were statistically significant connections between Class II malocclusion and scoliosis ($p = 0.033$) and between weak body posture and Class II malocclusion ($p = 0.028$).

Conclusion: The findings suggest that prophylactic screening should be implemented when pre-school infants have Angle Class II orthodontic findings. The orthodontist might then begin early orthodontic therapy to avoid incisor trauma in children with severe overjet and could also account for probable orthopaedic deformities in pre-school infants with Class II malocclusions on a preventive multidisciplinary basis.

Key Words: Malocclusion, Scoliosis, Body Posture, Orthodontic, Orthopedics.

Introduction

The literature review that follows highlights several important research that offer details on connections between orthopaedic and orthodontics. In order to evaluate a viable preventative strategy using methods that are supported by science, further clarification based on prospective studies of proband groups not chosen based on orthodontic treatment needs seems acceptable.

Child orthopaedics is the birthplace of general orthopaedics. Nicolas Andry [1] coined the phrase "orthopaedics" for the first time in 1741, which encouraged its spread across Europe. Using the Greek words "orthos" for straight and "paideia" for child care, he created this term with a focus on preventing youngsters from having poor posture. The symbol of this goal since the earliest description [1] has been the young, misshapen tree attached to a post that is being gently straightened out rather than using force. Andry [1] not only identified the causes of poor posture but also advanced orthopaedics' focus on prevention [1-19]. Since then, child orthopaedics has continued to advance and saw a significant increase throughout the industrial age at the end of the 19th century. However, ideas like "surgical orthopaedics" or "orthopaedics and traumatology" tended to fade into the background. Child orthopaedics was formed within orthopaedics when it was recognised as a medical speciality, with an emphasis on early detection and correction of children's hunched posture as a field that emphasises prevention. Early issues of contention were a result of traditional orthodontics, with treatment methods predicated on the idea that "the form follows the function." Diverse perspectives on the relationships are presented in the pertinent literature. For instance, Fränkel [9] connected this link to a favourable prognosis. He emphasised that the phrase "function regulator" was intended to demonstrate that the main purpose of that appliance wasn't to directly alter the dysmorphology associated with malocclusion by mechanical means. He asserted that the priority was to stop the faults brought on by a dysgnathic development. He thought that doing so would conform to the functional therapy principle as it was established in general orthopaedics, making orthodontics a legitimate subspecies of general orthopaedics.

The impact of body posture on jaw position had been discussed as early as 1902 by Robin [22], and Schwarz [24] stressed it once more in connection to head posture and jaw position in 1926. Gresham and Smithells [11] investigated 62 kids who had hyperlordosis of the cervical spine and poor head posture, and they found that these kids had a higher prevalence of Angle Class II instances than their "classmates" who had good head posture and a normal cervical spine inclination. A link between the location of the mouth, the hyoid bone, and the inclination of the cervical spine was first noted by Duyzings [6] in 1955. Müller-Wachendorff [18] investigated 1200 kids and discovered that patients with definite scoliosis and poor posture had a higher prevalence of malocclusion.

In 1964, Balters [3] asserted that Angle Class II patients frequently had an increased curve of the cervical spine and that malocclusions and poor body posture shared a common cause. Children with Angle Class II malocclusion postural deficits like kyphosis, lordosis, scoliosis, and functional leg shortness were given this label by Bahnemann [2]. Wachsmann [27] noted a larger frequency of malocclusions in individuals with poor posture, but in a 1960 investigation, he was unable to demonstrate an increased rate of dysgnathia among patients with cervical scoliosis. The association between physical asymmetry and unilateral crossbite was highlighted by Prager [21], and the present authors' previous investigation [16] supported this finding. Scoliotic pelvic and functional leg shortness were statistically significantly correlated with dental and jaw asymmetries.

Objectives

With regard to the distinction of multidisciplinary preventive diagnostic and therapeutic sectors between orthodontics and orthopaedics, the evaluation of correlations between orthopaedic and orthodontic data resulting from interdisciplinary investigations appears to be of scientific and practical importance. Therefore, the purpose of the current study was to investigate the relationships between orthodontic and orthopaedic findings in preschoolers and to assess them in light of preventive advice.

Material and methods

In the context of the current study, parents of 59 children (29 boys and 30 girls; ages 3.5 to 6.8) from a total of 64 pre-school infants provided their informed consent for an evaluation. Non-selected subjects from two kindergartens made up the collective. The standard deviation was 1.0 years, while the mean age was 5.0 years. The following conditions made up the exclusion criteria: physical or mental handicaps, general medical conditions requiring long-term treatment, chronic syndromes, and structural orthopaedic problems.

Orthopedic Examination

An experienced physiotherapist who had been conducting interdisciplinary consultations and examinations in association with the Department of Orthodontics, University of Münster, for the previous 9 years as part of a regular inter-disciplinary consultant service performed the orthopaedic examination based on techniques described in the literature [10, 19]. For the tests, a standard screening programme created inside this framework was employed. As usual, the minimal criteria for orthopaedic diagnoses were used; no gradings were given. Manual orthopaedic diagnostics cannot differentiate between severity levels with sufficient accuracy because the underlying examination is vulnerable to significant inter-examiner variance. As a result, the present investigation did not grade the orthopaedic findings. The screening programme instead recorded alternate findings (yes/no). A validity of 95% and good reliability were found after repeat exams on 20 patients at three distinct dates.

The summary orthopaedic findings are shown in Table 1, and the following justifications are relevant. A bending-forward test was conducted while the patient was standing to evaluate a scoliotic posture. Even minor thoracic and lumbar curvatures are detected by this test as an imbalance in the spinal profile. By palpating the lateral iliac crest to feel for an oblique pelvis and functional leg shortness, a routine examination approach was utilised to document the pelvic position. To confirm the effectiveness of the spinal muscles that support the spine, a postural test suggested by Matthiass [19] was employed. The person made a right angle with both hands out in front of them for this reason. If the person was unable to maintain that position for at least 30 seconds, a hypotonic posture was noted. In general, eye inspection might quickly detect foot abnormalities. While the subject was standing during the clinical examination, the plantar arch was evaluated, and a gait analysis was used to validate the clinical diagnosis.

Orthodontic assessment

The occlusion was clinically categorised using the Angle classification within the confines of the orthodontic evaluation. The tolerance for Angle Class I was set at 2 mm [8]. The deciduous canines were used to evaluate the occlusion. The anterior segment's vertical relationships between the upper and lower arch were also employed as diagnostic criteria; an overbite of up to 2.9 mm was considered normal, one of 3 mm or more was considered deep, and one of 0 mm or more was considered an open bite. Clinical midline deviation was rated progressively in millimetre increments starting at 1 mm. Normal lateral occlusion, lateral edge-to-edge bite, lateral crossbite, buccal nonocclusion, and lingual nonocclusion were the several types of lateral occlusion. In

the frontal perspective, the subject's face was evaluated and classified as symmetric or asymmetric.

Analytical Statistics

SPSS® 10.0 for Windows was used to conduct the statistical analysis (Lead Technologies, Haddonfield, NJ, USA). Arithmetic means with standard deviations, as well as the minimum and maximum ages, served as the foundation for descriptive statistics [28]. Without specifying the magnitude or the direction of the correlation, the y2 test (cross tables) was used to evaluate the independence of the line and column variables in the calculation of correlations. In cases where a table contains a cell with a predicted frequency of less than 5, Fischer's exact test was used for 2 2 tables. At p 0.05, the significant level was established.

Table 1. Parameters for orthopedic examination.

Orthopedic examination
Scoliosis
Oblique pelvis
Functional leg shortness
Weak body posture
Flat feet

Results

Orthodontic Examination

Angle Class I represented 63 percent of the distribution, followed by Angle Class II at 32 percent and Angle Class III at 5 percent (Figure 2). With Angle Class III generally being underrepresented, this was broadly in accordance with the normal distribution in non-selected groups of kids of this age structure [7]. Table 2 provides a summary of other distinct data relevant to the clinical orthodontic diagnosis.

Orthopedic examination

More than half of the children who were assessed had postural deficits, and several children had multiple postural impairments at once (Figure 3).

Correlations between Orthopedic and Orthodontic Findings

Within the context of the orthopaedic examination, differences between subjects with Angle Class I and Angle Class II malocclusion were noted, with an increased prevalence of orthopaedic parameters being detected in Angle Class II patients (Figure 4 and Table 3). Scoliosis of the vertebral spine was seen in 21.1 percent of children with Angle Class II, compared to 8.4 percent of the whole collective. Similar results were obtained for weak body posture, which was observed in 18.6% of the overall collective but in 52.6% of children in Angle Class II. Flat feet were discovered in 33.9% of respondents, with children in Angle Class II showing a noticeably greater prevalence (42.1 percent). A functional leg shortness due to an oblique pelvis was identified in 11.9 percent of the collective, and the rate was only marginally higher (15.8 percent) in the Angle Class II group. There was no discernible inclination toward a link with the other factors looked at. Children in the Angle Class II showed a statistically significant link with scoliosis ($p = 0.033$) and poor body posture ($p = 0.028$).

Table 2. Orthodontic findings.

Symptoms	Total n = 59	Boys n = 29	Girls n = 30	Class I n = 37	Class II n = 19	Class III n = 3
Anterior region Crossbite tendency	3	1	2	2	0	1
Crossbite	1	1	0	0	0	1
Open bite	3	2	1	2	0	1
Deep bite	23	14	9	11	12	0
Posterior region Normal occlusion	56	24	26	34	16	0
Crossbite tendency	1	0	1	1	0	0
Crossbite	2	1	1	1	0	1
Buccal nonocclusion	0	0	0	0	0	0
Lingual nonocclusion	0	0	0	0	0	0
Midline Correct midline	49	25	24	31	17	1
Functional midline deficiency	1	0	1	1	0	0
Dental midline deficiency	9	3	6	5	3	1
Midline deficiency (right side)	3	2	1	2	1	0
Midline deficiency (left side)	6	1	5	3	2	1

Table 3. Orthopedic findings

Total n = 59		Class I n = 37	Class II n= 19	Class III n = 3
Scoliosis	5	1	4	0
Oblique pelvis	7	4	3	0
Functional leg shortness	7	4	3	0
Weak body posture	11	3	7	1
Flat feet	20	11	8	1

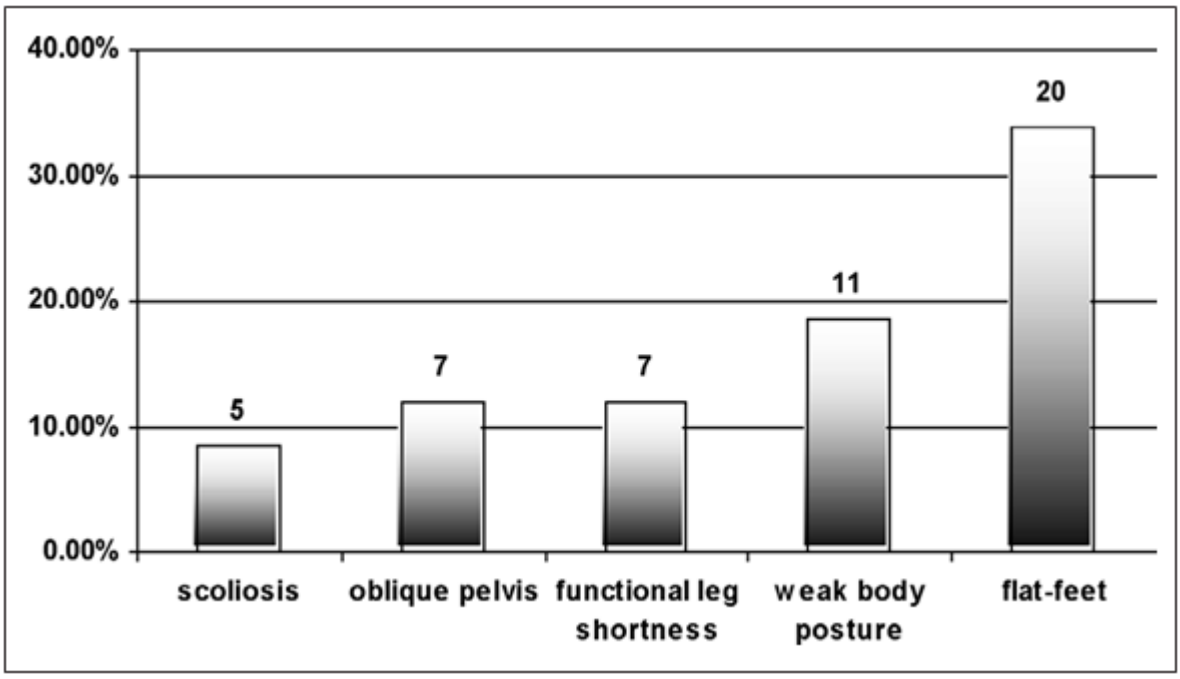

Figure 3. Orthopedic findings for the total collective

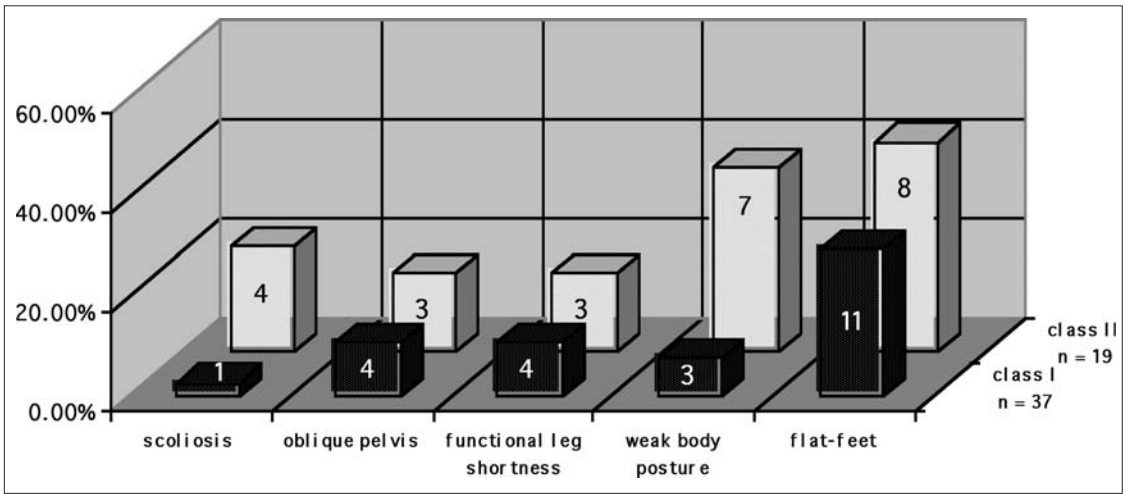

Figure 4. Orthopedic findings of Angle Class I and Class II patients.

Discussion

The findings of the present study support the recommendation that pre-school infants with Angle Class II undergo preventative orthopaedic screening. Thus, in order to prevent trauma to the incisors, the orthodontist should not only begin early orthodontic treatment in Class II patients with more than 7 mm overjet, but also consider the possibility of orthopaedic maldevelopments on an interdisciplinary prophylactic basis in all patients with Angle Class II, regardless of severity. This would back up the claims made by several authors in the mentioned literature, and orthodontics might be designated as a subspecies of general orthopaedics with some responsibility for a specific area.

Numerous research examining the relationship between Angle Class II and particular orthopaedic parameters have been reported [11, 13, 15, 16, 20, 21, 24, 25]. They suggest, to varied degrees of significance, a possible connection between Angle Class II malocclusions and Angle Class II scoliosis. The methodology and the different age structures of

the researched collectives preclude direct comparisons with the current study. The age range of the collective in the most recent study employing our design was 6 to 18 years [13]. Wachsmann [27] noted a "certain link" between malocclusion and poor body posture as early as 1960. As did Pecina et al. [20], Lukanowa-Skopakowa [17] and Pecina et al. [20] called for interdisciplinary coordination between orthodontists and orthopedists in preventative measures and therapy for patients with curvatures of the cervical spine and associated malocclusions. Close multidisciplinary collaboration between orthodontists and orthopedists is preferred due to the potential for some types of malocclusion to be identified as juvenile idiopathic scoliosis at an early stage. With interdisciplinary referrals of Class II patients to an orthopedist, this statement is relevant for preventive concepts and further research because it enables orthodontics to assume a role as a "subspecies of general orthopaedics" at a relatively early but crucial stage of childhood development, regardless of the orthodontic indication for early treatment.

According to Von Treuenfels [26], occlusion and cervical spine inclination are related, with Angle Class II, Division 1 patients having hyperlordosis of the cervical spine. Huggare & Harkness [15] and Rocabado [23] both validated the association between Angle Class II and a forward head position. In a study of 101 individuals, ages 6 to 18, with severe thoracic scoliosis, Hirschfelder & Hirschfelder [12] published in 1983 found a statistically supported higher prevalence of facial scoliosis. Hirschfelder & Hirschfelder [13] conducted another study in which they looked at the dependency of the vertebral spine posture and the sagittal jaw connection in 118 patients with ages ranging from 6 to 18. The findings revealed scoliosis in 34.7% of patients and weak body posture in 38% of them, with individuals with distoclusion being more frequently impacted. Although not statistically supported, a trend towards correlations with the sagittal jaw connection was identified. Torticollis and facial scoliosis have a statistically significant association, according to a study by Hirschfelder et al. [14]. There was a higher incidence of transverse dental arch compression and midline deviation toward the torticollis-affected side. In 1980, Prager [21] investigated the connections between malocclusions and postural deficits in a group of patients with vertebral column deviation abnormalities and in a group of controls without any pathologic orthopaedic findings. Patients with vertebral column abnormalities showed a statistically significant rise in malocclusion.

Recommendations from the Orthopedic Standpoint

Deformations are the most common abnormalities of the vertebral column during the growing phase. However, these don't always lead to growth problems [19]. The transition from crawling to upright walking suggests rejection of gravity. The muscles in the back, abdomen, pelvis, and legs provide the support. Deformities of the entire spinal column result from disturbances in this process, which may have an impact on the stomatognathic system.

Parents commonly miss a child's scoliosis since it is mostly painless in children. Often, parents are only alarmed when they notice that their child is not sitting up straight. Physiotherapy is recommended as a conservative treatment if the scoliotic curve is more than 10 degrees. Additionally, regardless of the degree of scoliosis, the German Society for Orthopedics and Traumatology (DGOT) has released guidelines advising that sporting activities be as intense as feasible. The most crucial method of averting long-term harm is this.

Nearly 30% of all children are found to have an idiopathic oblique pelvis with functional leg shortening of less than 1 mm as a result [19]. The fact that parents frequently fail to notice functional leg shortnesses of up to 2 cm does not mean that this scenario is innocuous. Adolescents with an oblique pelvis may experience secondary hip dysplasia on the longer leg's side, which can progress into statically induced scoliosis with fixation and

torsion. The spinal column often accepts pelvic inclinations of less than 1.5 cm without experiencing long-term effects. However, lumbosacral discomfort typically doesn't manifest until adulthood due to the uneven pressures on the hip joints. Physiologic flat feet in young children are typically a symptom that doesn't need to be treated. As long as the foot remains flexible and the person can actively maintain their upright position while walking, this symptom is not to be considered a pathologic condition.

Conclusion

We found strong associations between orthodontic and orthopaedic findings in pre-school infants, so we advise Angle Class II patients to undergo a multidisciplinary assessment and therapy concept as part of early orthodontic treatment. With reference to the early detection of orthopaedic issues, this would provide a prophylactic benefit. The early use of therapeutic treatments following a referral to an orthopedist could then support the young, still-developing vertebral column's healthy development.

In collaboration with the German Association of Pediatricians (BVKJ) and the Association of German Orthodontists (BDK), material-supported training courses for paediatricians have been made available since the year 2000 [4]. Pediatricians learn to diagnose malocclusions, facial dysmorphia, and orofacial dysfunctions as part of this accredited continuing education programme. In this way, interdisciplinary interaction is developed and paediatricians' orthodontic skill is improved. The benefit of this collaboration is that the pediatrician's initial checkup is planned for the preschool stage.

Simple interventions like physiotherapy and other orthopedist advice for specific sporting activities can frequently be used to assess or address postural problems in youngsters.

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