OCCLUSION OF PRIMARY DENTITION IN PRESCHOOL CHILDREN OF CHENNAI AND HYDERABAD –A COMPARATIVE STUDY

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INTRODUCTION

Childhood is the mirror in which are reflected the propensities of adulthood. Similarly, ideal primary dentition is the indicator of future ideal permanent dentition. The various functions of the deciduous dentition are to provide mastication as well as to maintain the occlusion and space for the permanent dentition17. Occlusion is defined as the relation between all the components of the masticatory system in normal function, dysfunction and parafunction. An ideal occlusion is the perfect interdigitation of the upper and lower teeth, which is a result of developmental process consisting of three main events

- Jaw growth
- Tooth formation and
- Eruption

The primary dentition is complete after the eruption of the second primary molars. This means that the location for eruption of the permanent teeth in the future has already been determined at this stage30. The dental arch circumference that connects the most distal surfaces of the right and left second primary molars should be preserved for the permanent dentition after the exchange of primary teeth. The relation of the distal surface of the maxillary and mandibular second primary molars is, therefore, one of the most important factors that influence the future occlusion of the permanent dentition. The mesial-distal relation between the distal surface of the upper and lower second primary molars is called the terminal plane when the primary teeth

contact in centric occlusion. The terminal plane can be classified according to Baume in 1950 into three types **a) Flush terminal plane-** When the distal surfaces of the upper and lower second primary molars were in the same vertical plane in centric occlusion. **b) Distal step-** When the distal surface of the lower second deciduous molar is more distal to that of the upper in centric occlusion. **c) Mesial step-**When the distal surface of the lower second deciduous molar is more mesial to that of the upper in centric occlusion3 0. This relationship is used to forecast the interocclusal relation of the erupting first permanent molars in the future. This relationship, while functionally unimportant at this time, can greatly influence the position of the first permanent molars later, as the eruption path of the first permanent molars is guided by the distal surface of the distal root and tooth crown of the second primary molar.

It is very common to find physiological spaces in the primary dentition. The prevalence of spaced dentitions varies between different ethnic groups, ranging from 42% (Treimann 1961) to 98 % (Byoko 1968)1 0. Spacing often presents between all anterior primary teeth with the most marked spaces present in the maxilla mesial to canines and in the mandible distal to canines. These are called primate or anthropoid spaces (Baume 1950)7. Another type of space in the primary dentition is the secondary or developmental spaces, whic h are usually found between the incisors (Friel 1954). Such dental spaces are termed “physiological spaces”. These spaces are later very important to the alignment of erupting permanent teeth and establishment of occlusion. Absence of these spaces in the primary dentition is an expression of

disproportion between jaw/ tooth size. The establishment and maintenance of normal

occlusion constitute one of the important objectives of pedodontic treatment whether it is preventive, interceptive, or corrective. The understanding of the anteroposterior changes that occur in the occlusion between the deciduous and permanent dentition is crucial for the clinician involved in early orthodontic treatment8. In order to provide information on the state of the occlusion and the spaces available at the time of completion of the eruption of the primary dentition, this study was carried out in Chennai and Hyderabad (South India).

REVIEW OF LITERATURE

Baume LJ (1950) conducted a study regarding the physiologic tooth migration and its significance on the development of the occlusion. He reported that it was common to have spacing in the primary dentition and for the second primary molars to have flush terminal plane relationship, it was observed in almost 50% of the population. He considered that the relationship of the second primary molars remained the same between 4 and 6 years of age. The spacing in the primary dentition in relation to the canines were referred by him as “Simian gap”. He finally concluded that at the time of eruption of the first permanent molars, the initial occlusion was dependent on the terminal plane relationship of the primary second molars.

Sheldon Friel (1951) studied the form of gum pads at birth. He observed the division of the pads into sections which correspond to the

underlying deciduous teeth. The sections for the second deciduous molars are very poorly defined at birth and do not really show until about 5 months of age. Maxillary gum pad is larger anteroposteriorly and transversely than the mandibular, and in occlusion it overlaps in front and at the sides. They demonstrated that the increase in the size of the alveolar arches, from birth to the time just before the eruption of the incisors.

Carlos Sania, Bhim S. Savara, Quentin C. Clarkson et al

(1970) studied the possibility of predicting occlusion in the permanent dentition from using various characteristics in the deciduous dentition. The study casts of the deciduous and permanent dentitions of each person were classified as either acceptable occlusion or malocclusion, resulting in the following four groups, acceptable in the deciduous and permanent dentitions; malocclusion in the deciduous and permanent dentition; malocclusion in the deciduous dentition and acceptable in the permanent dentition; acceptable in the deciduous dentition and malocclusion in the permanent dentition. It was found that malocclusion in the deciduous and permanent dentitions tend to have narrower deciduous dental arches. Acceptable occlusion in the deciduous and permanent dentition tend to have smaller deciduous teeth.

Richardson E.R (1972) conducted a study to determine whether there was an increase in deciduous bicanine width and arch circumference in the maxilla before the exfoliation of the deciduous incisors and to determine whether the increase was reflected by an increase in the size of the inter dental spaces mesial to the deciduous canine. Fifty three Negro children were participated in this study. Alginate impressions

were taken and were poured immediately in orthodontic stone. These records were taken every six months. They were followed until just prior to the exfoliation of the deciduous maxillary incisor teeth. He concluded that an increase in bicanine width in 96% of the cases and there was no significant difference in the developmental behavior of the closed and open dental arches between the ages of 3 ½ and 5 ½ years. The mean increase in bicanine width of the closed dentition was 0.725mm, while that of the open dentition was 0.742mm.

Bhupendra S. Arya, Bhim S. Savara et al (1973) carried out a longitudinal study on the deciduous terminal plane relationship and occlusion of the first permanent molars in fifty- four boys and sixty - four girls 4 ½ to 14 years of age. Three pairs of study casts were selected for each subject. The first pair of study casts was of the complete deciduous dentition just before the eruption of the first permanent molar, the second study cast had the first permanent molars coming into initial contact, and the third study cast had all the permanent teeth, anterior to the first permanent molars erupted. To evaluate the influence of the deciduous terminal plane relationship on the initial occlusion of the first permanent molars a chi squre test was applied. Results showed that most of the first permanent molars which erupted in distal or normal occlusion did not change their occlusion. First permanent molars which erupted in cusp to cusp initial occlusion, 70% became class I while the remainder became class II. They concluded that the deciduous terminal plane relationship appears to influence the initial occlusion of the first permanent molars to a considerable extent but is not the sole determinant.

Ram S. Nanda, Inamullah Khan, and Reena Anand

(1973) examined the occlusal patterns of 2,500 children, 2 to 6 years of age. They concluded that straight terminal plane relationship predominated at all ages. The terminal relationship patterns seemed to change with age, and this was caused by mesial migration of the mandibular arch and by mesial mandibular shift. There was a significant reduction in overjet and overbite with age.

C.L.B. Lavelle (1975) compared the results from methods of arch analysis for examination of the dental arch age changes between Caucasoids, Mongoloids and Negroids. A total of 2040 sets of maxillary and mandibular casts were obtained from equal samples from three ethnic groups Caucasoids, Mongoloids and Negroids between the ages of 4 and 20 years. The dimensions of the dental casts were measured by means of digital caliper. They concluded that in all three ethnic groups, two spurts of growth in dental arch area were noted between 5 and 7 and 11 and 13 years. Throughout the age range the dental arch index was greatest in Negroids and least in Mongoloids, with that for Caucasoids being intermediate and they noted marked changes in the arch dimensions in the 5-7 and 11- 13 year age groups in each ethnic group.

Feasby W.H (1978) studied the natural developmental changes in occlusal relationships from birth to the period of developed dentition. He concluded that distribution of categories of occlusion at initial occlusion in primary dentition was, distal step 23.3%, cusp to cusp 49.2% and normal 26.7%, others 0.8%. In permanent dentition the distribution was, Class II – 38.6%, Class I – 58.9%, Class III – 2.5%. He observed some of the flat terminal planes were moving to a mesial

step prior to the eruption of the first permanent molars. This early mesial shift was due to mandibular growth.

Samir Bishara (1988) assessed one hundred and twenty one subjects (242 sides) who were followed from deciduous dentition to the permanent dentition for an average period of eight years. The purpose of the study was to describe the changes in the molar relationship from deciduous to permanent dentition. Sides that started with a distal step in deciduous dentition ended in a class II molar relationship. Fifty six percent of the cases with flush terminal place resulted in Class I molar relationship and 44% into Class II molar relationship. Mesial step in deciduous dentition suggests a greater probability to Class I molar relationship and a lower probability for Class II molar relationship.

Sekikawa M, Kanazawa E and T. Ozaki (1988) evaluated relationships of cusp height between the upper and lower first molars and between the deciduous second molars in Japanese subjects. Plaster casts of the molar crowns were photographed by moire contourography. Each plaster cast was set in the position of the standard tricuspal plane, where the cuspal tips of the paracone, metacone and protocone for the upper molar and the protoconid, metaconid and entoconid for the lower molar were set in the same plane parallel to the horizontal grafting of the moiré apparatus. The moire photograph of each tooth was enlarged eight times for enhancement of the moire contour lines. The heights of the cusps were recorded by counting the number of contour lines from the deepest point of the occlusal table (central fossa). In permanent molars, the height of the hypoconid had a mean value similar to that of the upper trigonal cusps, indicating that upper and lower functional cusps of the same height occlude with each other. In deciduous second

molars hypoconid heights were significantly smaller than trigonal cusps heights. The differences in cusp height between permanent and deciduous dentition have been attributed to the function and phylogeny of tooth or jaw movements.

Alphouro Trottman and Henry G. Elsbach (1996)

conducted a study on 238 children including both black and white people within the age groups of 2 to 5 years. They assessed the molar relationship and anterior and posterior cross bite. It was concluded that the ethnic background has some effect on malocclusion. The prevalence of Class II molar relationship and anterior cross bite was more in black whereas Class III relation was more in white people. There was no significant difference between genders of same group.

Najat M.A. Farsi and Fouad S. Salama (1996) carried out a cross sectional dental survey of 520 Saudi children aged 3 – 5 years from Riyadh city. The parameters recorded were terminal plane relationships of second primary molar, canine relationship, degree of overjet, overbite, anterior cross bite, posterior cross bite, infraocclusion, scissor bite. It was found that 80% presented with the flush terminal plane relationship, 11.9% mesial step, 8.1% distal step, 85.7% Class I canine relationship, 10.9% Class II and 3.3% Class III. More than half of the children (56.7%) had a normal overbite, overjet ranged from 0 to 6mm, with a mean of 1.6mm. Thus it was concluded that Saudi children had less tendency for malocclusion during primary dentition.

Pascal Tschill, William Bacon and Abdul Sonko (1997)

studied the occlusal characteristics of the deciduous dentition of Caucasian children aged 4 – 6 years. The subjects of this study were 407 boys and 318 girls. Overjet ranging from 1 – 3mm was seen in 76%

of patients, while in 16.7% of the children overjet exceeded 3mm. Edge to edge or negative overjet was recorded in 7.2% of children. There was no sex difference existed in the overjet measures. Edge-to-edge or negative overbite existed in 37.6% of the subjects. Overbite between 1 and 3mm was seen in 60.8% of the children. Overbite exceeded 3mm in 1.6% of the cases. This study suggested that major occlusal trends and characteristics of adult dentition can be determined early.

Tiziano Baccetti, Lorenzo Franchi, James A. McNamara et al (1997) monitored the clinical findings of a class II malocclusion in primary dentition to the mixed dentition stage over a 2½ year period. The study samples consisted of 25 patients with class II malocclusion (distal step, class II canine relationship, increased overjet) were compared with 22 subjects with ideal occlusion (Flush terminal plane, class I canine relationship and normal overjet, overbite). The mean age in primary dentition was 5 years 8 months where as in mixed dentition it was 8 years 1 month. Transverse discrepancy between the arches and overjet was measured from the cast for both dentition. Serial cephalometric radiography were taken and studied. The results showed that the clinical findings of Class II malocclusion in primary dentition persisted in mixed dentition with the skeletal discrepancy worsened more. There was very little growth of mandible compared to maxilla. Thus an early treatment of these patients was recommended.

Samir E. Bishara, Jane R. Jakobsen et al (1998)

conducted a longitudinal study to note the changes in maxillary and mandibular arch length over a 45 year period. The sample included 67 infants of both gender whose casts were prepared at 6 weeks, 1 year and 2 years or before all the primary dentition would have erupted. Another

sample included 15 people of each gender at 3, 5, 8, 13, 26, and 45 years. For evaluation five maxillary and seven mandibular landmarks were marked on the cast and measurements were taken. They concluded that greatest incremental increase in arch length of both arches occurred in the first two years of life. Arch length increased up to 13 years in maxilla and 8 years in the mandible after which there was a significant decrease in arch length up to 45 years of age.

Ana Beatriz Alonso, Daniella, Teresa Cristina Moreira (2002) have evaluated the prevalence of malocclusion and the relationship with oral habits. The prevalence of malocclusion in the primary dentition was 78.8%. The open bite was the most prevalent malocclusion (31%) followed by posterior cross bite (10.8%), deep bite (10.8%), anterior cross bite (7.2%). The habits were considered to be the etiological factors for the establishment of open bite and posterior cross bite.

Abu Alhaija E.S.J and M.A. Qudeimat (2003) conducted a randomized clinical evaluation of 1048 (485 girls, 565 boys) preschool children in the governate of Irbid, Jordan. Occlusal relationship such as primary molar occlusion, primary canine relationship, degree of overjet and overbite were measured on the study casts using electronic digital sliding calipers by a single examiner. The results revealed that 47.7% presented with mesial step, 37% with flush terminal plane, and 3.7% with distal step. When canine relationship was evaluated 57% of the children had Class I, 29% had a Class II and 3.7% had a Class III relationship. Half of the children presented with Class I incisors with normal overjet followed by Class II division 1 (24.7%), Class II division 2 (13.5%) and Class III with reverse overjet in 11.8% of children examined. This study had provided an insight into the dental

status, dental arch dimensions, occlusal pattern, spacing and crowding in primary dentition in Jordanian children.

SUMMARY AND CONCLUSION

This study aimed to record various primary dentition parameters in 890, 3-5 ½ year old school children from two cities, Chennai and Hyderabad. The findings of present study can be summarized as:

1. The bilateral flush terminal plane relationship of the second primary molars was most frequent i.e. 74% in Chennai and 72.5% in Hyderabad group. No significant differences for the flush terminal plane were noted between two groups and between boys and girls.
2. Canine Class I relationship was the most prevalent relationship in two groups i.e. 84.2% in Chennai group and 85.7% in Hyderabad group. There were no significant differences between two groups and between both sexes.
3. Spaced dentition was the most common in primary dentition of the children in Chennai (73.6%) and Hyderabad (74.1%) group. There were no significant differences between both groups and between both sexes.
4. The majority of the children in two groups, 80.7% in Chennai group and 89.3% in Hyderabad group had an Overjet of 0-2 mm. There was significant difference in both groups [p- value 0.001 (sig)] but no significant difference between the males and females in both groups as well as within the group.

5. Present study showed that the prevalence of Overbite 0% -30% was most frequent i.e. 46% in Chennai group and 48.5% in Hyderabad group. There were no significant differences in both groups.

It can be concluded that this study had provided prevalence of occlusal characteristics and spacing in the primary dentition of South Indian children. Future longitudinal studies are needed to follow up the dental development of children throughout the whole growth period to ascertain changes that may occur during the transitional periods of the dentition.

BIBLIOGRAPHY

1. **Abu Alhaija and M.A. Qudeimat.** Occlusion and tooth/ arch dimensions in the primary dentition of preschool Jordanian children. *Int J Paed Dent.2003;13: 230-239*.

2. **Adler P.** Effect of some environmental factors on sequence of tooth eruption. *J Dent Res. 1963; 42(2): 605-615.*

3. **Alexander S, Prabu NT.** Profiles, occlusal plane relationships and spacing of the teeth in the dentitions of 3 to 4 year old children. *J. Clin Pediac Dent 1998; summer; 22 (4): 329-34.*

4. **Alf Tor Karlsen**. Craniofacial characteristics in children with Angle Class II div.2 malocclusion with extreme deep bite. *Angle Orthod. 1994; 2: 123-130.*

5. **Alphonso Trottman , Henry G. Elsbach**. Comparison of malocclusion in preschool black and white children. *Am J Orthod. 1996; 110: 69-72.*

6. **Araya BS, Savara BS.** Prediction of first molar occlusion. *Am J Ortho 1973; 63: 610-621.*

7. **Baume LJ**. Physiologic tooth migration and its significance for the development of occlusion. *J Dent Res 1950; 29: 123-132.*

8. **Bhupendra S. Arya, Bhim S. Savara et al.** Prediction of first molar occlusion. *Am J Orthod.1973; 63(6): 611-621.*

9. **Birgit Thilander, Lucia Pena.** Prevalence of malocclusion and orthodontic treatment need in children and adolescents in Bogota, Colombia. An epidemiological study. *Eur J Orthod. 2001; 23: 153-167.*

10. **Byoko DJ**. The incidence of primate spaces in 50, 3- year old children of Burlington study. *Amer J of Ortho 1968; 54: 462-465.*

11. **C. L. B. Lavelle**. Age changes in dental arch. *J Dent Res.1970; 49: 1517-1521.*

12. **C. L. B. Lavelle**. The shape of the dental arch. *Am J Orthod. 1975; 67: 176-184.*

13. **Carvalho JC, Vinker F, Declerck D**. Malocclusion, dental injuries and dental anomalies in the primary dentition of Belgian children. *Int J Paed Dent. 1998 June; 8(2): 137-41.*

14. **Daniella Della valle.** Prevalence of malocclusion in 4- 6 year old Brazilian children. *J Clinc Ped Dent. 2002; 27: 81-86.*

15. **Dixon DA.** Ethnic variations in the incidence of submerged deciduous molars correlated the vertical dysplasia of the human face and dentition. *Eur J Orthod. 1974; 19(4): 199-205.*

16. **Farsi NM, Salama FS**. Characteristics of primary dentition, occlusion in a group of Saudi children. *Int J Paed Dent. 1996 Dec; 6(4): 253-9.*

17. **Gerald Z. Wright and David**. Space control in the primary and mixed dentitions. *Dent Clin N Amer. 1978; 22(4): 579-601.*

18. **Graber TM**. Orthodontics. Principles 3 rd practice. *WB Saunders Co, London. 59; 1962*.

19. **Helms S**. Malocclusion in Danish children with adolescent dentition; An epidemiological study. *Amer J Ortho. 1968; 54: 352-366.*

20. **Humphreys H, Leighton B**. A survey of anteroposterior abnormalities of the jaws in children between the ages of 2 and 5.5 years. *British Dent J.1950; 88: 3-5.*

21. **Infante P.** Malocclusion in the deciduous dentition in white, black and Apache Indian children. *Angle Ortho. 1975; 45: 213-218.*

22. **Kanoknart Chintakanon**. Ectopic eruption of the first permanent molars; Prevalence and etiologic factors. *Angle orthod. 1998; 2: 153-160.*

23. **Kaufman A et al.** Normal occlusal patterns in the deciduous dentition in preschool children in Israel. *J Dent Res. 1967; 46: 478-482.*

24. **Kisling E, Kerbs G.** Patterns of occlusion in 3- year old Danish children. *Community Dentistry and Oral Epidemiology 1976; 4: 152-159.*

25. **Lunt RC, Law DB.** A review of the chronology of eruption of deciduous teeth. *J Amer Dent Assoc 1974; 89: 872-879.*

26. **Lunt RC, Law DB.** A review of the chronology of calcification of deciduous teeth. *J Amer Dent Assoc 1974; 89: 599-606.*

27. **Mathews JR.** Malocclusion in the primary dentition. *Dent Clin N Amer. 1966: 463-78.*

28. **Melsen B. and J. Pedersen.** Sucking habits and their influence on swallowing pattern and prevalence of malocclusion. *Eur J Orthod. 1979; 1: 271-280.*

29. **Moyers R.** Handbook of Orthodontics, *Chicago 1988, Yearbook Medical.*

30. **Nakata M, Wei S**. Occlusal guidance in pediatric dentistry, *Ishiyaku Euro America Inc. 12-13: 1988.*

31. **Nanda RS, Khan I, Anand R.** Age changes in the occlusal pattern of the deciduous dentitionn. *J Dent Res. 1973; 52: 221-224.*

32. **Otuyemi OD, Sote EO, Jones SP.** Occlusal relationships and spacing or crowding of the teeth in the dentition of 3-4 year old Nigerian children. *Int J Paed Dent 1997; 7: 155-160.*

33. **Pascal T, baacon W, Sonko A**. Malocclusion in the deciduous dentition of Caucasian children. *Eur J Orthod. 1997 Aug; 19(4): 361-7.*

34. **Richardson ME.** The etiology of late lower arch crowding alternative to mesially directed forces; a review. *Am J Orthod. 1994; 105: 592-597.*

35. **Samir E. Bishara.** Arch length changes from 6 weeks to 45 years. *Am J Orthod.1998; 1: 69-74.*

36. **Samir E. Bishara.** Changes in the molar relationship between the deciduous and permanent dentitions: A longitudinal study. *Am J Orthod. 1998; 93: 19-28.*

37. **Sekikawa M.** Cusp height relationships between the upper and lower molars in Jap anese Subjects. *J Dent Res.1998; 67(12): 1515-1517.*

38. **Stuart D. Josell.** Habits affecting dental and maxillofacial growth and development. *Dent Clin N Amer. 1995; 39(4): 851-9.*

39. **Tiziano Baccetti, Lorenzo Franchi, James**. Early dentofacial features of Class II malocclusion; A longitudinal study from the deciduous through the mixed dentition. *Am J Orthod.1997; 111: 502-9.*

40. **W. H. Feasby.** Developing molar occlusion. *Dent Clin N Amer. 1978; 22(4): 557-561.*

41. **Wayne J. Sampson and Richards**. Prediction of mandibular incis or and canine crowding changes in mixed dentition. *Am J Orthod.1985; 2: 47- 63.*