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Predictable outcome of siblings treated simultaneously with similar orthodontic extraction plan – A case report

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Abstract

This case report describes the association of genetics and orthodontic treatment of two siblings who were presented with different malocclusion, openbite and deepbite respectively. They were treated simultaneously with orthodontic fixed appliance after extraction of all second premolars. The final treatment results were satisfactory with the same treatment plan

Introduction

Malocclusion is the manifestation of complex genetic and environmental interactions on the development of the oral-facial region. Historically, orthodontists have been interested in genetics as a means to better understand why a patient has a particular occlusion and to determine the best course of treatment for the malocclusion. Each child receives half of his or her genes from each parent, but not likely the same combination of genes as a sibling unless the children are monozygotic twins. When looking at parents with a differing skeletal morphology, knowing which of the genes in what combination from each parent is present in the child is difficult until the child's phenotype matures under the continuing influence of environmental factors. Siblings have been noted as often showing similar types of malocclusion. Niswander noted that the frequency of malocclusion is decreased among siblings of index cases with normal occlusion, whereas the siblings of index cases with malocclusion tend to have the same type of malocclusion more often. There are high correlation coefficient values between parents and their offspring for class II and class III malocclusions. Examination of parents and older siblings has been suggested as a way to gain information regarding the treatment need for a child, including early treatment of malocclusion.[1] This paper reports orthodontic treatment of two cases of sibling with different malocclusion.

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Diagnosis and Etiology

Case: 1 (Elder sister)

A 16 year of age female presented with complaint of proclined upper front teeth. Extraoral examination revealed she had convex profile, increased lower anterior facial height, incompetent lips, everted lower lips, acute nasolabial angle, increased incisal exposure at rest and smile. intraoral examination showed class I molar and canine relation, increased overjet, anterior openbite, spacing in upper anterior region, mesiolingually rotated lower second premolars, high frenal attachment in upper labial region, restoration in 46 &47 and dental caries in 36&37. The upper midline was coincident with the facial midline, whereas the lower midline was positioned 2mm to the left of the upper. Anterior tongue thrusting was also noticed during functional examination. Her oral hygiene was satisfactory (Figure 1a).

Case: 2 (Younger sister)

A 12 year of age female presented with complaint of proclined upper front teeth. On

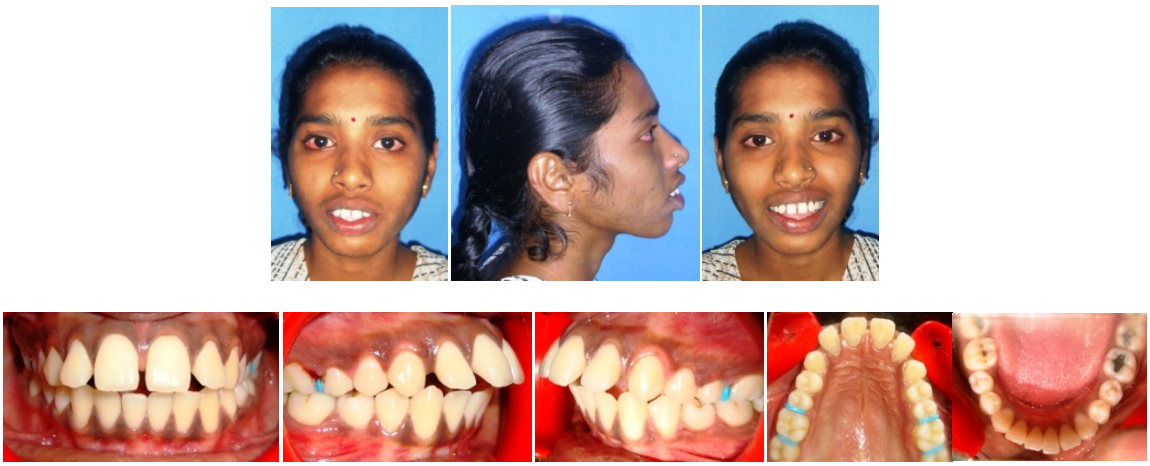

Fig : 1a pretreatment extra and intraoral photographs

Fig : 1b pretreatment extra and intraoral photographs

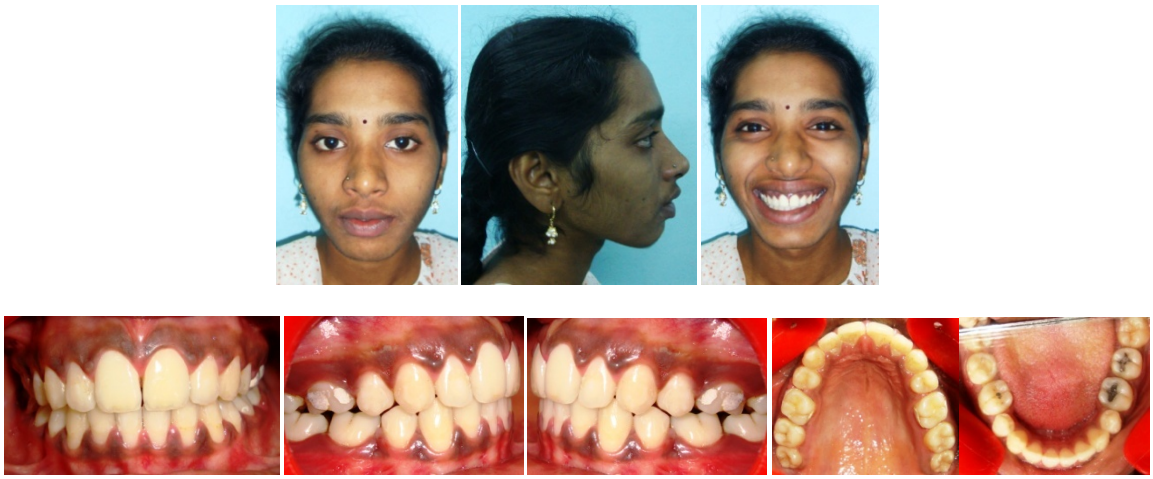

Fig : 2a Postreatment extra and intraoral photographs

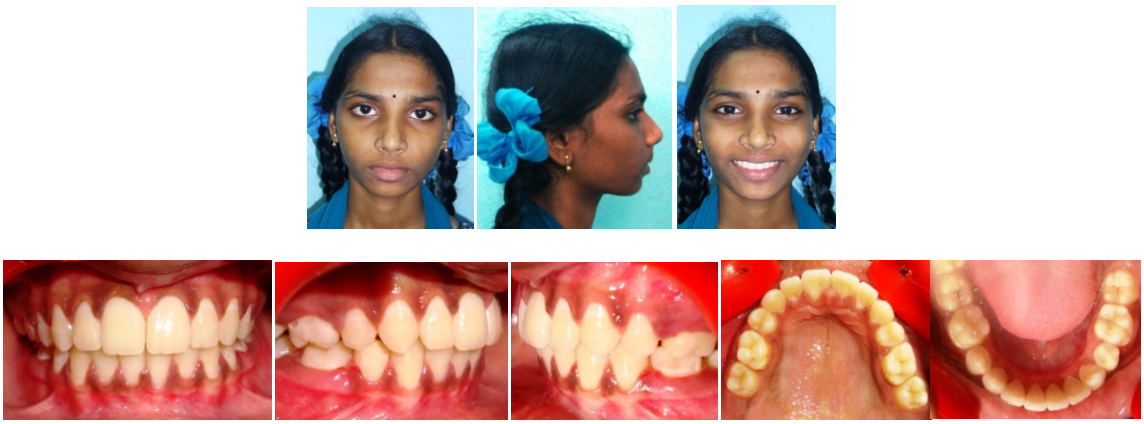

Fig : 2b postreatment extra and intraoral photographs

extraoral examination she also had convex profile, increased lower anterior facial height, potentially competent lips and hyperactive mentalis muscle. Intraoral examination showed class I molar and canine relation, increased overjet, deepbite, spacing in upper anterior region, high frenal attachment in upper labial region, coincident upper and lower dental midline and dental caries in 37. Her oral hygiene was satisfactory (Figure 2a). Both cases showed angle's class I malocclusion with spacing on class II skeletal base due to retrognathic mandible. But vertical problems was different, elder had openbite and younger had deepbite. The probable etiology for elder was environmental factor such as tongue thrusting habit. Sibling growth pattern was vertical in nature.

Treatment Objectives

The treatment objectives were to restore decayed teeth, accept class II skeletal base. Correct anterior tongue thrusting habit, correct overjet and overbite, close spaces in upper anterior region, correct deviated midline, remove thick upper labial frenum, improve soft tissue profile, control vertical growth and decrease lower facial height.

Treatment Plan

Based on the proclination and vertical growth type, we decided to extract all second premolars. The second premolar extraction was done in case of minimal anchorage need and to decrease facial height.[2] After extraction of all second premolars, treatment proceeded with fixed appliance. The 0.022 slot ROTH prescription brackets were bonded in upper and lower arch. Preformed molar band with buccal tube were cemented to all first molar. Initially alignment and leveling was achieved with 0.014 Nickel Titanium archwire. Progressively thicker dimension wire like 0.016, 0.017× 0.025 and 0.019× 0.025 nickel titanium wire were used. After alignment and leveling completion, space closure was initiated with elastomeric chain in 0.019× 0.025 Stainless steel. At the end of extraction space closure, appliance was debonded and Begg's retainer were used in both arch to maintain the correction. Siblings were satisfactory with the treatment results (Figure 2a & b).

Results and Discussion

Genetic mechanisms are already predominant during embryonic craniofacial morphogenesis but environment is also thought to influence dentofacial morphology postnatally, particularly during facial growth. A better understanding of the relation effects of genetic and environment on dentofacial and occlusal parameters should improve our knowledge on the etiology of orthodontic disorder and therefore also on the

possibilities and limitation of the orthodontic treatment planning.

Numerous studies have examined how genetic variation contributes to either or both occlusal and skeletal variation among family members. Curtner (1953) superimposed lateral cephalograms of children on those of their parents. He found close parent – sibling similarities for many craniofacial structures. Margolis et al (1968) came to a similar conclusion in a cephalometric study of the parents and sibling of 68 families. Fernex et al (1967) found boys to show more similarities to their parents than girls. Facial skeletal structures were more frequently transmitted from mother to son than from mothers to daughters. Female twins showed greater concordance in facial feature than male twins. Hunter et al (1970) found genetic correlation to be strongest between fathers and children, especially in mandibular dimensions. There was a significant relation in facial height between mothers and their offspring. Litton et al (1970) concluded that siblings usually show similar types of malocclusion and examination of older siblings can provide a clue to the need for interception and early treatment of malocclusion.[3] Manfredi et al in a more recent study on monozygotic twins, dizygotic twins and same sex siblings, assessed the inheritance traits of the orthodontic cephalometric parameters and they also suggested that the vertical parameters were genetically controlled than the anteroposterior ones, heritability seemed to expressed more anteriorly than posteriorly and mandibular shape seemed to be determine more genetically than the mandibular size. Savoye et al also reported that the vertical proportions are highly under genetic control.[4] The most frequent inherited malocclusion was found to be the facial deformity and openbite malocclusion with dolicofacial pattern.[5] In 1970 Hunter, using linear measurements on lateral cephalograms, demonstrated that there is a stronger genetic component of variability for measurements in vertical dimension rather than for measurements in the sagittal dimension. The assessment of the longitudinal data of the siblings revealed that the heritability of skeletal characteristics was stronger than the heritability of dental characteristics. Hereditary factors were found to be responsible for only 40% of the skeletal and dental variations resulting in a malocclusion and the genetic component was higher for skeletal pattern than for dental features.[6]

In this report, siblings shared some skeletal and dental features, such as retrognathic mandible, increased lower anterior facial height, vertical growth pattern, proclined upper anterior teeth and spacing, high frenal attachment and class I molar relationship. These findings were suggestive of genetic similarities in both sister, which helps us to plan similar treatment for them.

Conclusions

Successful treatment of any orthodontic problem depends on an appropriate diagnosis of its etiology. Genetic and environmental factors play an important role in etiology of dentofacial region. Recent studies and advances in genetic sciences allowed the orthodontists to better understand the effects of genetics on the etiology of dentofacial character and response to orthodontic treatment.

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