

## Treatment timing of class II malocclusion: A review

Singh VP<sup>1</sup>, Sharma JN<sup>2</sup>

<sup>1</sup>Assistant Professor, <sup>2</sup>Additional Professor and Head of Department, Department of Orthodontics, College of Dental Surgery, B P Koirala Institute of Health Sciences, Dharan, Nepal.

### Abstract

There has been a controversy regarding the timing of orthodontic treatment for correction of class II malocclusion. This article reviews the various aspects of orthodontic treatment timings in the light of current literature. Early orthodontic treatment is effective and desirable in specific situations and has been shown successful by many studies. However, the recent evidences indicated that such an approach might not be more effective than a single-phase treatment. Therefore, clinicians must review various parameters and decide on a case to case basis, the ideal timing of orthodontic treatment considering the effectiveness, cost benefit ratio, long-term stability, patient compliance and duration of treatment. For some patients early treatment may be advisable but for many it may be better delaying treatment until later in their dental and skeletal development.

**Key words:** Early treatment, Class II malocclusion, Randomized control trials

### Introduction

“Treatment started either in primary or mixed dentition that is performed to enhance the skeletal and dental development before the eruption of the permanent dentition. Its purpose is to either correct or intercept a malocclusion and reduce the need or the time for treatment in the permanent dentition.”<sup>1</sup> This definition of early treatment as described by Dr. Bishara outlines few goals of early treatment. However the timing of this early treatment has been a controversial topic. In determining the optimal timing for orthodontic treatment, few considerations are important: effectiveness (how well does it work?) and efficiency (what is the cost-benefit ratio, with cost in its broader sense of the burden of treatment?). The timing of treatment can affect both important issues. Both must be kept in mind when deciding when to treat various orthodontic problems, and both are an important background for the application of some principles of treatment timing.

### These principles are

- Growth modification often is desirable. Ample evidences now show that growth modification is most successful when it accompanies the adolescent growth spurt and ends about the time rapid growth subsides. Otherwise, the original growth pattern will

lead to a loss of the correction. The bottom line: if you start growth modification too late, it doesn't work; if you start it too soon, it takes too long.

- Facial growth in the 3 planes of space declines to adult levels at different times. Therefore, it makes sense to time growth modification procedures differently for different problems.
- Tooth eruption correlates, but not very well, with the stage of skeletal growth. The timing of treatment often must be adjusted because skeletal and dental development is not in synchrony.
- Permanent teeth often do not erupt where their deciduous predecessors were. This means that a second stage of treatment in the early permanent dentition is usually necessary when the initial treatment was done in the mixed dentition.

Based on these principles, the gold standard for orthodontic treatment timing is during the adolescent growth spurt, starting in the late mixed or early permanent dentition. At that time, some growth (especially vertical growth) remains available to assist treatment, permanent teeth are available for final positioning, treatment usually ends as the adolescent growth spurt ends, and the shorter treatment time lowers the burden of treatment<sup>2</sup>.

### Correspondence

Dr. Varun Pratap Singh, Assistant Professor, Department of Orthodontics, College of Dental Surgery, B P Koirala Institute of Health Sciences, Dharan, Nepal, E-mail: varundc@gmail.com

## Historical Perspectives

The best timing for treatment of Class II malocclusion has been controversial. The question is whether early treatment, which is initiated during the mixed dentition, is more effective and efficient than treatment started in the permanent dentition<sup>2</sup>. Can early treatment provide superior skeletal, dental, or esthetic results? Reviews of Class II treatment studies before 1989 concluded that, because of their inadequate designs, it was not yet known whether early treatment provided enough benefits to justify it<sup>3, 4</sup>.

## Discussion

Substantial evidence supports the theory that early growth modification therapy can lead to an improvement, if not complete correction of the Class II malocclusion. The mechanisms by which the correction is achieved, and whether early correction has advantages over the correction during phase II treatment lead to three fundamental questions:

1. Is facial growth altered or is the correction due to dentoalveolar changes?
2. If facial growth is altered, do the changes represent a permanent effect or simply a short-term response that will be negated by subsequent growth?
3. Is the mechanism of change acting on the maxilla, the mandible or both?<sup>5</sup>

The results of three widely publicized randomized clinical trials specifically designed to address these important issues were published<sup>6,7,8</sup>. The randomized clinical trial is considered to be the gold standard for clinical research. Tulloch and colleagues<sup>6</sup> published a study comparing of the benefits of two-phase vs. one-phase Class II treatment. In this randomized clinical trial, children with a moderate-to severe Class II malocclusion were randomly assigned to one of three groups: headgear treatment, bionator therapy or an observational group in which no treatment was rendered. The results indicated that treatment with either headgear or bionator has been successful in improving the relationship of the jaws in most children (75 percent), although there was a significant individual variation noted in both treatment groups, as well as in the untreated control group. Reliable predictors for a favorable growth response were not identified. The second phase of their study was designed to test whether these changes can produce long-term differences. Once the permanent teeth emerged, the subjects were randomly assigned to orthodontic fixed-appliance (phase II) therapy. At the completion of treatment, the investigators found no significant differences among the three groups in regard to subjects' skeletal relationships, as determined by their cephalometric measurements. In addition, there were no significant differences in subjects' occlusions. It appears,

then, from the results of this study that, on average, the skeletal changes that occur with early treatment are temporary and do not represent long term changes. These authors concluded that for children with moderate-to severe Class II malocclusion, early (phase I) treatment followed by conventional orthodontics later on (phase II) does not produce skeletal or occlusal relationships that differ substantially from those produced by phase II treatment alone. Moreover, severity of the problem and total treatment time are not important influences on the final result, while variations in skeletal growth patterns do seem to play an important role.

Ghafari and colleagues<sup>7</sup> performed another randomized clinical trial to determine the effectiveness of early treatment in the correction of the Class II malocclusion. In this study, conducted at the University of Pennsylvania, 63 patients with Class II malocclusion who were between the ages of 7 and 13 years were randomly assigned to either a straight-pull headgear group or a Frankel therapy, or FR-II, group. As a result of treatment, the sagittal discrepancy was reduced in both groups. Similar to the previous study results, the results of the study showed that the headgear correction was due primarily to its effect on the maxilla, while the FR-II had its greatest influence on mandibular position. In regard to the dentition, improvements in molar and canine relationships were greater in the headgear group, while overjet correction was better in the FR-II group, although this difference in overjet correction was not statistically significant. These occlusal differences were probably due in part to the greater influence of the headgear on the posterior dentition and the palatal force exerted on the maxillary incisors by the labial bow of the FR-II.

To address the issue of ideal treatment timing, the investigators further categorized the experimental groups on the basis of eruption of the permanent canines, premolars and permanent second molars. None of the changes mentioned above was influenced by these stages of dental development. As reported by them, Class II treatment seems to be just as effective in late childhood as it is at an earlier age.

Keeling and colleagues<sup>8</sup> reported findings from a similar randomized clinical trial conducted at the University of Florida. They employed headgear (cervical or occipital anchorage with acrylic intraoral bite plane) and bionator treatments in preadolescent children. Again their results showed short-term skeletal changes. Subjects in both treatment groups demonstrated enhanced mandibular growth compared with subjects in the control group. One-year follow-up after completion of treatment in this study showed that the skeletal changes were stable; however, some of the dental movements relapsed.

These clinical trials suggest that both the single and two-phase approaches are effective in correcting the Class II malocclusion. As evident by the current evidence the correction in class II cases appears to be due to both skeletal and dental change, depending on the particular treatment modality. Again within the skeletal changes, different appliances and therapies seem to exert more influence on one jaw over the other. Headgears seem exert their effect predominantly on maxilla while mandible repositioning appliances like bionator and frankel appears to exert their effect predominantly on mandible. Other findings along with these also suggest that as long as the patient is treated while he or she is still growing, the time at which treatment begins may not make a difference in the success of the Class II correction<sup>9, 10</sup>.

### Conclusions

If the findings in the light of current literature are considered then it can be concluded that both single phase and two phase treatment are effective in treatment of class II malocclusion. However, various other factors should be considered like the cost benefit ratio, long term stability of results, patient compliance and duration of the treatment before making an option. Some researchers justify early treatment because of the psychological benefits, improved self esteem and reduction in the increased susceptibility to trauma, however this has to be taken with caution as both these objectives are still controversial in literature and there has been no clear-cut evidence for the same.

### Future Directions

With the advent of latest techniques in molecular genetics, the treatment approaches are also changing and gene therapy for oral therapy is already instituted in animal studies. So again this issue does not appear to settle quickly because these new approaches have to be instituted at correct time to get satisfactory results<sup>11</sup>.

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