

Experts Corner

Early class III treatment decision-making

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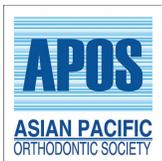
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ABSTRACT

Clinicians make decisions for their patients everyday. Ryan Hamilton, in his course guidebook, *How You Decide: The Science of Human Decision Making*, summarized the current research on the 4 R's of decision-making that matter: reference points, reasons, resources, and replacement. The authors will apply this principle in the decision-making necessary for the growing Class III patients. First, the decision on whether to treat or not to treat Class III patients in the mixed dentition rely on a thorough diagnosis and objectives for early treatment. For example, elimination of a functional shift of the mandible may be a good reason to institute early treatment. Second, the decision on when to start Phase II treatment relies on the follow-up observation after Phase I treatment. The authors suggested the use of a "checklist" to decide whether patient will be benefited from surgical intervention or nonsurgical orthodontic treatment. If the checklist review has several negative checkpoints, it will help the clinicians to decide on an aggressive stage of 4-8 months therapeutic re-diagnosis to confirm the surgical or nonsurgical decision.

Keywords: Class III treatment, Phase I treatment, Decision-making, Treatment planning, Treatment timing

INTRODUCTION

Studies have shown that humans make over 30,000 decisions per day in normal lives.^[1] Likewise, orthodontists make decisions for their patients in their offices everyday. It is worthwhile for orthodontists to understand factors involved in the human decision-making process. Ryan Hamilton, in his course guidebook, *How You Decide: The Science of Human Decision Making*, summarized the current research on this topic with the 4 R's of decision-making that matter: reference points, reasons, resources, and replacement.^[2] The authors will apply these principles in the decision-making necessary for the growing Class III patients.

Reference points and Class III treatment decisions

When people make decisions, losses loom larger than that of gains.^[2] Gain or loss is determined by comparing to a reference point. In the management of Class III treatment, a clinician may choose to recommend early treatment. The reference point is a large negative Wits appraisal. The gain would be better early function and more balanced facial esthetics. The loss, if early treatment fails, would be a diminished trust in the clinician's future treatment recommendations. However, if the Class III condition that appears worse is due to a anterior functional shift rather than a true skeletal problem, the initial reference point or the large negative Wits appraisal is not as severe; treatment outcome will be more favorable with nonsurgical treatment.^[3]

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Reasons and Class III treatment decisions

“When a choice for which there is no clearly superior option, seemingly almost any reason can serve as grounds for the choice.”^[2] To treat or not to treat the early Class III condition? Some clinicians have had bad experiences or failure when treating Class III patients early and therefore allow growth to proceed and postpone the treatment to a later date as a surgical case. On the other hand, many clinicians treating Class III patients can find reasons to recommend early intervention such as in cases that the parents are very concerned, as chewing seems difficult, the occlusal problem will worsen with time, maxillary growth will respond to orthopedic traction when the patient is younger, and the patient is unhappy with dentofacial appearance.^[4]

Resources and Class III treatment decisions

The fact that people are limited in terms of attention, effort, and self-control has two implications: first, our decision-making is a function of resources we have available to us. We have different decision rules and multiple cognitive systems that are geared toward either making fast and easy, resource-conserving decisions or slow and deliberative, resource-consuming decisions. We slip into the easier, resource-conserving mode any time we are exhausted or distracted.^[2] Second, because decisions consume these limited resources, people have become strategic in how they spend them. Humans have developed sacrificing rules, habitual responses, and availability heuristics.^[2]

For the growing Class III patient, then, the clinician should make every effort to assess the “resources” and pay attention to the plan and potential compliance of the patient and the family. Resource assessment takes provider time and requires effective patient education. While this can be delegated to an experienced treatment coordinator, both patients and parents will engage more of their “resources” if the educational material is presented by the orthodontist who is the decision-maker.

Replacement and Class III treatment decisions

This consideration in decision-making relates to the fact that when people are presented with difficult tasks, they will often replace a difficult task with a perceived easier one.^[2]

For example, in Class III treatment, if a child patient finds it difficult to wear a reverse pull headgear to the maxilla for 10–12 h a day, he/she may decline to cooperate as needed. Through the “replacement mechanism,” the child may use his or her limited youthful wisdom by persuading the parents and the orthodontist to replace the reverse pull headgear with a surgical solution even though they do not really know what that entails and the associated risks/costs.

Decision-making for early Class III treatment

Class III malocclusion can be diagnosed as early as primary dentition.^[5] Young patients presented with a Class III molar relationship, and an anterior crossbite may have a combination of skeletal, dentoalveolar, and functional components [Figure 1].^[6] To complicate the diagnosis further, the skeletal component of Class III malocclusions frequently has contributions of maxillary deficiency and mandibular excess. In addition to the apparent Angle Class III malocclusion, there may be transverse and vertical issues that require attention.

Functional Class III problems

Functional Class III problems can be diagnosed by checking if there is a discrepancy between the maxilla and mandible in centric relation and centric occlusion.^[7] In addition, patients should be evaluated in the vertical dimension for hypodivergent or hyperdivergent growth pattern. This diagnosis can be achieved by measuring the inclination of the occlusal plane (OP) and the ratio of lower anterior face height to total face height. It is notable that Class III functional shifts may also generate an asymmetry, which if left untreated can contribute to a true skeletal asymmetry.^[8]

Early elimination of centric occlusion/centric rotation (CO/CR) discrepancy will help in diagnosing the true underlying skeletal problems in all three planes of space and create a functional matrix that is more likely to lead to favorable and balanced growth of both jaws [Figure 2].^[9]

Skeletal Class III problems

Patients with no functional or CO/CR discrepancy should also be evaluated in the vertical dimension to identify the

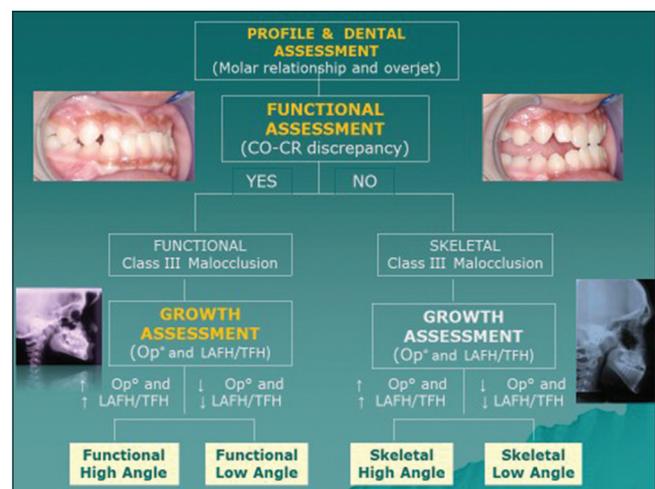


Figure 1: Classification of developing Class III malocclusion for early Treatment. CO: Centric occlusion; CR: Centric relation; LAFH: Lower anterior face height; OP: Occlusion plane inclination; TFH: Total facial height.

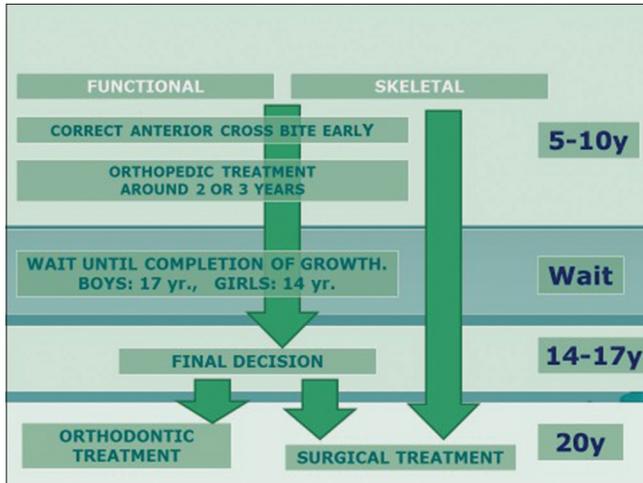


Figure 2: Treatment protocol for functional and skeletal Class III patients.

growth pattern as hypodivergent or hyperdivergent. Several authors have recommended early treatment of Class III skeletal problems to take advantage of growth modification. The validity of Phase II treatment is supported by studies that show greater orthopedic effects when treatment is started in younger patients.^[10] Literature have shown that reasons do matter because decisions by orthodontists to treat early provide less invasive or nonsurgical treatment.^[11]

With the advent of bone-anchored orthopedic device, Class III patients with maxillary deficiency may benefit more from early orthopedic treatment and more changes that are favorable for children and adolescents than previously thought.^[12]

Orthopedic correction of mild and moderate skeletal Class III conditions should be accompanied by regular progress evaluations to avoid creating significant dental compensations of the anterior dentition that can lead to adverse periodontal and esthetic outcomes with reduced long-term stability.

Poor candidates for growth modification are patients with mandibular excess and/or vertical excess. However, Class III malocclusions with mandibular excess seldom occur without some components of maxillary anteroposterior (AP) and vertical deficiency. Therefore, if maxillary AP, transverse, and/or vertical deficiency are present, it still may be advantageous for the patient to have an early orthopedics to reduce the potential for these discrepancies to become worse. The remaining mandibular growth excess can then be treated as a one-stage/one-jaw procedure.

Longitudinal growth studies by Sugawara and Mitani showed similar maxillary and mandibular incremental growth change during pre-pubertal, pubertal, and post-pubertal periods when compared with Class I subjects.^[13] The authors

hypothesized that excess mandibular prognathism may be related to the change in OP or Wits appraisal.

Early orthodontic or orthopedic treatment to eliminate functional CO/CR discrepancy can be accomplished using expansion with a partial fixed appliance, orthodontic removable traction appliance, protraction face mask, removable functional appliance or chin cap appliance therapy, or each of these at different stages or in combination.^[14] Appliance choice should, therefore, take into consideration available patient/parent “resources” for the required compliance.

It is important to set treatment objectives prior to initiation of early treatment to avoid prolonged Phase I treatment time. One of the key clinical objectives is to clearly communicate to the parents the goals of this stage of treatment (reference points) to achieve desired compliance and family support, thereby preserving needed resources for future stages of treatment.

Retention protocol is paramount after orthopedic or orthopedic Phase I treatment to maintain early anteroposterior, vertical, and transverse treatment results and maintain the achieved incisor alignment.^[4] Frequently, bonded lingual arches are used to stabilize the aligned upper incisors which preserve smile esthetics and reduce the needed for long-term removable appliance wear, draining the patient’s “resources.”

Clinical decisions on Phase II Class III treatment

It is recommended that patients should wait until near completion of pubertal growth spurts prior to making decisions for Phase II treatment. In boys, it would be around 17 years and 14 years of age in girls.^[14,15] In many patients, the timing of initiation of Phase II will be determined by the skeletal age rather than the chronologic age. During this observation or waiting period, periodic monitoring and communication regarding initial treatment response and the long-term treatment objective are imperative to avoid starting Phase II treatment before all the growth data are assessed.

Clinicians will need to decide at that time whether the patient can be camouflaged with orthodontic tooth movement or wait until completion of growth for surgical treatment.

Musich developed a checklist [Figure 3] to help clinicians in planning whether to pursue nonsurgical treatment or surgical intervention. If the checklist review has several negative checkpoints, it will help the clinician to decide to proceed aggressively with a 4–8 months therapeutic diagnosis to confirm the nonsurgical or surgical decision or accept the fact that the best outcome can only be achieved with surgery.^[4] The authors have found that the Class III checklist incorporates the 4 R’s of decision-making by the orthodontist and be a useful to guide the parent (and patient) to an optimal

Patient's Name:	_____			Age	_____	Skel. Age	_____
Gender (Circle):	Male	Female					
• Family History	Yes	No	_____				
• Initial diagnosis (mand excess)	Yes	No	(% Max vs. Mand)				
• Response to Phase I	Good	Fair	Poor	_____			
• Diagnosis @ Ph II (Wits)	Better	Same	Worse				
• Facial balance	Mild	Mod.	Severe				
• Skeletal age @ Ph II	Favorable	Neu.	Unfavorable	_____			
• Growth Pattern	Favorable	Neu.	Unfavorable (asym)				
• Ging Health/Root length	Favorable	Neu.	Unfavorable (biotype)				
• Capacity to Camouflage	Favorable	Neu.	Unfavorable	_____			
• Compliance	Favorable	Neu.	Unfavorable	_____			
• Growth hormone	Yes	No	Maybe in future				

Figure 3: A checklist for making decision on phase II treatment for non-surgical, surgical, or therapeutic diagnosis treatment. This is best used for Class III patients who had Phase I treatment and there is strong consideration to initiate Phase II treatment. The findings of the checklist serve as a useful guide for clinician's to choose to continue with a non-surgical approach, or attempt an aggressive therapeutic diagnosis with a 4-8 month re-assessment of response, or wait for growth completion and plan Phase II in conjunction with necessary jaw surgery.

course of treatment reducing the chance a overtreatment or undertreatment. This checklist is also a good communication tool as to help the parents and the patient understands the reason for the decisions that are made.

The variables that enter into the analysis process make the orthodontist's decision extremely difficult are factored into the Class III checklist:

- Is there a family history of mandibular prognathism?
- Does the patient's initial diagnosis include mandibular prognathism or is the patient's condition primarily due to maxillary retrusion? Note that the growth of the maxilla is primarily sutural and can be modified, whereas condylar growth is endochondral and is genetically controlled.
- After following the patient for several years, what is the growth pattern, magnitude, and direction revealed by superimposition of growth and treatment changes.
- Is the growth pattern forward and upward or downward and backward?
- Does the Wits appraisal become more negative as growth proceeds, indicative of a Class III pattern dominated by mandibular excess?

Assess treatment response using the Wits measure as a reliable guide:

- Wits changes will serve as a horizontally corrected growth treatment response vector.^[16]
- Pre-treatment Wits compared to the reevaluation Wits (3-4 years after initiation of treatment) will give an

indication of the stability of the initial correction, and this is useful to illustrate to patients and to parents the positive effect of the initial orthopedic therapy. Long-term Class III treatment requires ongoing positive reinforcement that progress is occurring.

Incorporate treatment response findings into recommendations of further treatment – nonsurgical or surgical depending on the severity of the Wits differential.^[3]

- Does the superimposition of cephalograms show similar growth in amount and direction or differential growth of the maxilla and mandible?
- Is there additional growth that will undermine the current outcome?
- Is the response to Phase I treatment favorable? Does the maxilla come forward with maxillary protraction? Does the mandible respond to chin cap therapy with change in gonial angle?
- Is the patient complying with the mechanotherapy as needed? Are there ways to encourage great compliance if needed? Should new “non-compliance” strategy be introduced?
- If there is additional dental compensation available to achieve a stable/esthetic incisal relation and will the patient and the parents accept the facial esthetic outcome.
- What are the limits of dental compensation on an imbalanced Class III skeletal relationship, functionally and esthetically and short-term and long-term?
- Will growth hormone be prescribed by the physicians? Clinicians need to be aware of the timing of hormone therapy and how it may impact the current maxilla-mandibular growth imbalance.^[17]

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Conflicts of interest

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REFERENCES

1. Daum K. How to Make Great Decisions (Most of the Time) Inc. magazine; 2012. Available from: <http://www.inc.com/kevin-daum/how-to-make-great-decisions-most-of-the-time.html>.
2. Hamilton R. How You Decide: The Science of Human Decision Making. Chantilly, Virginia: The Great Courses Publishing; 2016.
3. Stellzig-Eisenhauer A, Lux CJ, Schuster G. Treatment decision in adult patients with class III malocclusion: Orthodontic therapy or orthognathic surgery? Am J Orthod Dentofacial Orthop 2002;122:27-37.
4. Ngan P, Musich D. Stability and relapse of Class III treatment.

- In: Katsaros C, Eliades T, editors. Stability, Retention and Relapse in Orthodontics. USA: Quintessence Publishing; 2017. p. 93-124.
5. Tollaro I, Baccetti T, Bassarelli V, Franchi L. Class III malocclusion in the deciduous dentition: A morphological and correlation study. *Eur J Orthod* 1994;16:401-8.
 6. Ngan P, Sung J. Treatment strategies for developing and non-developing Class III malocclusions. In: Nanda R, editor. Biomechanics and Esthetics Strategies in Clinical Orthodontics. 2nd ed. Philadelphia: Elsevier Inc; 2014. p. 246-93.
 7. Ngan P, He H, Wilmes B. Treatment of Class III Malocclusions in the Growing Patients In: Ngan P, Deguchi T, Roberts E, editors. Orthodontic Treatment of Class III Malocclusion. Bentham eBook, Ch. 4 p. 61-115, 2014. Available from: <http://www.eurekaselect.com/123372/volume/1>.
 8. Saito I, Ohashi N. Class III facial asymmetry, mandibular deviation and its related surgical orthodontic treatment. In: Ngan P, Deguchi T, Roberts E, editors. Orthodontic Treatment of Class III Malocclusion. Bentham eBook. Ch. 9 p. 228-258; 2014. Available from: <http://www.eurekaselect.com/123372/volume/1>.
 9. Moss ML. The functional matrix hypothesis revisited 1. The role of mechanotransduction. *Am J Orthod Dentofacial Orthop* 1997;112:8-11.
 10. Woon SC, Thiruvenkatachari B. Early orthodontic treatment for class III malocclusion: A systematic review and meta-analysis. *Am J Orthod Dentofacial Orthop* 2017;151:28-52.
 11. Sugawara J, Aymach Z, Hin H, Nanda R. One-phase vs 2-phase treatment for developing class III malocclusion: A comparison of identical twins. *Am J Orthod Dentofacial Orthop* 2012;141:e11-22.
 12. Rodríguez de Guzmán-Barrera J, Sáez Martínez C, Boronat-Catalá M, Montiel-Company JM, Paredes-Gallardo V, Gandía-Franco JL, *et al.* Effectiveness of interceptive treatment of class III malocclusions with skeletal anchorage: A systematic review and meta-analysis. *PLoS One* 2017;12:e0173875.
 13. Sugawara J, Mitani H. Facial growth of skeletal class III malocclusion and the effects, limitations, and long-term dentofacial adaptations to chin cap therapy. *Semin Orthod* 1997;3:244-54.
 14. Reyes BC, Baccetti T, McNamara JA Jr. An estimate of craniofacial growth in class III malocclusion. *Angle Orthod* 2006;76:577-84.
 15. Kuc-Michalska M, Baccetti T. Duration of the pubertal peak in skeletal class I and class III subjects. *Angle Orthod* 2010;80:54-7.
 16. Ngan P, Wei SH. Early Treatment of Class III patients to improve facial aesthetics and predict future growth. *Hong Kong Dent J* 2004;1:24-30.
 17. Hwang CJ, Cha JY. Orthodontic treatment with growth hormone therapy in a girl of short stature. *Am J Orthod Dentofacial Orthop* 2004;126:118-26.

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