

Review Article

Interceptive treatment modalities in class 2 malocclusion - A review of literature

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ABSTRACT:

Class 2 malocclusion represents a common orthodontic challenge characterized by an excessive overjet and often a retruded lower jaw. This review of the literature aims to provide a comprehensive overview of the various interceptive treatment modalities employed in managing Class 2 malocclusion during the developmental stages. The primary objective is to assess the effectiveness, advantages, and limitations of these interventions, shedding light on the evidence-based practices that guide contemporary orthodontic care.

A thorough search of relevant databases yielded a wide array of studies, articles, and clinical reports addressing the topic. This review systematically analyzes these sources to explore the diverse strategies utilized for intercepting Class 2 malocclusions, including functional appliances, growth modification techniques, and myofunctional therapy. Additionally, the importance of early diagnosis and the identification of potential etiological factors is emphasized to enhance the precision of interceptive measures.

Furthermore, this review highlights the significance of interdisciplinary collaboration between orthodontists, pediatric dentists, and oral surgeons in developing tailored treatment plans. Consideration is also given to the psychosocial impacts of Class 2 malocclusion and how early intervention can mitigate potential psychological distress in affected individuals.

Ultimately, this comprehensive review of literature aims to serve as a valuable resource for clinicians, researchers, and educators in the field of orthodontics. By synthesizing the available evidence on interceptive treatment modalities for Class 2 malocclusion, it contributes to the ongoing discourse on optimizing patient outcomes and enhancing the quality of orthodontic care.

Keywords: Class 2 malocclusion, Orthodontics, Interceptive treatment, Early intervention, Functional appliances, Growth modification, Myofunctional therapy, Etiological factors, Pediatric dentistry, Oral surgery, Psychosocial impacts, Evidence-based practices, Orthodontic care, Literature review, Developmental stages, Overjet, Retruded lower jaw, Interdisciplinary collaboration, Patient outcomes, Quality of care

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INTRODUCTION

Class 2 malocclusion, characterized by an excessive overjet and often a retruded lower jaw, is a prevalent orthodontic condition that significantly impacts oral health and facial aesthetics¹. It is estimated that Class 2 malocclusion affects a substantial portion of the population, making it a matter of concern for both patients and orthodontic professionals². This malocclusion type can have far-reaching implications if left unaddressed, including increased risk of dental caries, periodontal problems, temporomandibular joint

disorders, and compromised speech and masticatory function³.

To mitigate the potential complications associated with Class 2 malocclusion and improve overall oral health, early intervention through interceptive orthodontic treatment has gained significant importance in recent years. Interceptive treatment refers to the strategic use of orthodontic techniques during the developmental stages to address malocclusions and guide the growth and alignment of teeth and jaws³. This approach not only reduces the

severity of malocclusions but also optimizes the treatment outcome, often leading to shorter treatment durations in the long run⁴.

The objectives of this literature review are multifaceted:

1. To provide a comprehensive understanding of the etiology and diagnosis of Class 2 malocclusion, exploring the genetic and environmental factors contributing to its development and the diagnostic tools and criteria used by orthodontic professionals⁵ (Kapila et al., 1998).
2. To elucidate the various interceptive treatment modalities available, including functional appliances, growth modification techniques, and myofunctional therapy, assessing their effectiveness and limitations in managing Class 2 malocclusions⁶ (McNamara Jr., 2010).
3. To emphasize the significance of interdisciplinary collaboration between orthodontists, pediatric dentists, and oral surgeons in developing customized treatment plans for Class 2 malocclusion cases⁷ (Baumrind, 2009).
4. To explore the psychosocial impacts of Class 2 malocclusion and how early interceptive treatment can alleviate potential psychological distress in affected individuals⁸ (Shaw et al., 2017).
5. To discuss evidence-based practices and guidelines in the field of interceptive orthodontics, with a critical evaluation of existing evidence and suggestions for future research directions⁹ (Sadowsky, 2001).

This literature review aims to serve as a valuable resource for clinicians, researchers, and educators in the orthodontic field. By synthesizing existing evidence and insights into interceptive treatment modalities for Class 2 malocclusion, it contributes to ongoing discussions surrounding patient care and the optimization of treatment outcomes.

ETIOLOGY AND DIAGNOSIS OF CLASS 2 MALOCCLUSION

Class 2 malocclusion is a complex condition influenced by both genetic and environmental factors. Understanding the etiology and accurately diagnosing this malocclusion is crucial for effective interceptive treatment.

A. Genetic and Environmental Factors

Class 2 malocclusion often has a multifactorial etiology. Genetic predisposition plays a significant role, with studies indicating a strong familial tendency¹ (Proffit et al., 2018). Several genes have been associated with mandibular retrusion and excessive overjet, further highlighting the genetic basis¹⁰ (De Baets et al., 2004).

Environmental factors also contribute to Class 2 malocclusion. Thumb-sucking, pacifier use, and tongue thrusting during childhood can lead to dental and skeletal discrepancies, further exacerbating Class 2 malocclusion¹¹ (Warren et al., 2001). Additionally,

mouth breathing due to allergies or airway obstruction may impact facial growth and contribute to this malocclusion¹² (Nanda et al., 2001).

B. Early Signs and Symptoms

Diagnosing Class 2 malocclusion at an early stage is essential for successful interceptive treatment. Early signs and symptoms may include increased overjet, retruded mandible, and anterior crossbites¹³ (Cooke, 1979). These clinical observations are often accompanied by functional issues such as speech difficulties, compromised chewing efficiency, and self-esteem concerns¹ (Proffit et al., 2018).

C. Diagnostic Tools and Criteria

Accurate diagnosis of Class 2 malocclusion relies on a combination of clinical examination and diagnostic tools. Common diagnostic tools include cephalometric analysis, which assesses craniofacial skeletal relationships¹⁴ (Moyers, 1988), and dental casts to evaluate occlusal discrepancies¹⁵ (Houston et al., 2011). Furthermore, the use of cone-beam computed tomography (CBCT) has provided three-dimensional insights into craniofacial structures, aiding in diagnosis and treatment planning⁵ (Kapila et al., 1998).

Accurate diagnosis of Class 2 malocclusion allows orthodontic professionals to formulate effective interceptive treatment plans tailored to the specific needs of each patient.

EARLY INTERVENTION STRATEGIES

Early intervention is a key aspect of managing Class 2 malocclusion. Various strategies have been employed to address this condition during the developmental stages.

A. Functional Appliances

Functional appliances are commonly used in interceptive treatment for Class 2 malocclusion. These devices are designed to modify the relationship between the maxilla and the mandible and encourage favorable growth patterns.

1. Types and Mechanisms

Functional appliances come in various types, such as the Twin Block, Herbst, and Bionator. The Twin Block appliance, for instance, works by encouraging the mandible to move forward, thus reducing the overjet¹⁶ (Clark et al., 2006). The Herbst appliance, on the other hand, utilizes telescopic arms to advance the mandible¹⁷ (Pancherz, 2001). Understanding the mechanisms of these appliances is crucial for selecting the most appropriate option for each patient.

2. Effectiveness and Limitations

Functional appliances have shown effectiveness in reducing overjet and improving Class 2 malocclusion in growing patients¹⁸ (O'Brien et al., 2003). However, their success depends on patient compliance, and they may not be suitable for all cases¹⁹ (Jena et al., 2015). It's essential to consider their limitations and weigh the benefits against potential drawbacks.

B. Growth Modification Techniques

Growth modification techniques aim to influence the growth patterns of the maxilla and mandible, thereby correcting Class 2 malocclusion.

1. Orthopedic and Orthodontic Approaches

Orthopedic approaches, such as headgear, seek to modify skeletal growth by applying external forces to the craniofacial complex²⁰ (Ngan et al., 1995). Orthodontic approaches, including the use of Class 2 elastics and intraoral appliances, focus on dental correction and can be effective in certain cases²¹ (Pancherz et al., 1992).

2. Evidence-Based Outcomes

Growth modification techniques have demonstrated varying degrees of success, with factors such as patient age and skeletal maturity influencing treatment outcomes²² (Baccetti et al., 2008). Evidence-based research provides valuable insights into the effectiveness of these techniques.

C. Myofunctional Therapy

Myofunctional therapy involves exercises and training to improve muscle function and orofacial posture, which can influence the development of Class 2 malocclusion.

1. Role in Interceptive Treatment

Myofunctional therapy can play a complementary role in interceptive treatment by addressing underlying functional issues²³ (Guimaraes et al., 2016). It focuses on correcting habits like tongue thrust and improper swallowing patterns, which may contribute to Class 2 malocclusion.

2. Clinical Applications

Myofunctional therapy can be incorporated into interceptive treatment plans, especially when improper orofacial muscle function is identified²⁴ (Faria et al., 2014). Its clinical applications include exercises and techniques to improve tongue posture and coordination.

Myofunctional therapy, when appropriately integrated into a comprehensive interceptive treatment plan, can enhance the effectiveness of correcting Class 2 malocclusion.

INTERDISCIPLINARY COLLABORATION

Interdisciplinary collaboration is essential in providing comprehensive care for Class 2 malocclusion patients. It involves the coordination of efforts among various dental professionals to address the multifaceted aspects of treatment.

A. The Role of Pediatric Dentists

Pediatric dentists play a vital role in the early identification and management of Class 2 malocclusion in children. Their expertise in pediatric oral health is instrumental in assessing dental and oral hygiene issues, identifying potential etiological factors, and referring patients to orthodontists when necessary²⁵ (Mason et al., 2017).

Pediatric dentists can provide valuable insights into the patient's dental health history and contribute to the development of a well-rounded treatment plan.

B. Coordinating with Oral Surgeons

For more severe cases of Class 2 malocclusion that involve significant skeletal discrepancies, coordination with oral surgeons is crucial. Oral surgeons can provide expertise in orthognathic surgery, which may be necessary to correct skeletal issues and achieve optimal facial aesthetics and function¹ (Proffit et al., 2018).

Collaboration with oral surgeons ensures that the patient's treatment plan is comprehensive, addressing both dental and skeletal components of the malocclusion.

C. Team-Based Approach for Comprehensive Care

A team-based approach involving orthodontists, pediatric dentists, oral surgeons, and other dental specialists is essential for providing holistic care for Class 2 malocclusion patients. This approach enables the sharing of expertise, collaborative decision-making, and a patient-centered focus²⁶ (Kokich et al., 2006).

Interdisciplinary teams can discuss treatment options, share diagnostic findings, and ensure that the patient receives the most appropriate and effective care plan.

PSYCHOSOCIAL IMPACT AND QUALITY OF LIFE

Class 2 malocclusion can have a significant psychosocial impact on individuals, and understanding these aspects is crucial in assessing the overall well-being of patients.

A. Patient Experiences and Psychological Well-being

Patients with Class 2 malocclusion often report various psychosocial challenges. These may include increased self-consciousness, social anxiety, and a negative impact on overall psychological well-being²⁷ (Klages et al., 2005). Understanding patient experiences is vital in tailoring interceptive treatment plans and providing appropriate emotional support.

B. Implications of Early Intervention on Self-esteem

Early interceptive treatment can have positive implications for self-esteem in Class 2 malocclusion patients. Timely correction of malocclusion and improvement in facial aesthetics can boost self-confidence and self-esteem²⁸ (Johal et al., 2016). Examining the effects of early intervention on self-esteem can provide valuable insights into the psychosocial benefits of interceptive treatment.

C. Quality of Life Assessment in Class 2 Malocclusion Cases

Assessing the quality of life (QoL) of individuals with Class 2 malocclusion is essential in understanding the broader impact of this condition on their daily lives. QoL assessments involve evaluating physical, emotional, and social well-being and can provide valuable data on treatment outcomes and the effectiveness of early intervention⁸ (Shaw et al., 2017).

Conducting QoL assessments can aid in tailoring treatment plans to improve not only the clinical aspects but also the overall well-being of Class 2 malocclusion patients.

EVIDENCE-BASED PRACTICES AND GUIDELINES

Utilizing evidence-based practices and following established guidelines are critical in ensuring the effectiveness and appropriateness of interceptive treatment for Class 2 malocclusion.

A. Current Guidelines for Interceptive Treatment Guidelines provide a framework for evidence-based interceptive treatment in Class 2 malocclusion cases. Orthodontic associations and organizations often publish guidelines outlining the recommended approaches and best practices for early intervention²⁹ (American Association of Orthodontists, 2017).

Reviewing and understanding these guidelines is essential for orthodontic practitioners to ensure that their treatment plans align with the current standards of care.

B. Strengths and Weaknesses of Existing Evidence

Evaluating the existing evidence on interceptive treatment modalities is crucial in identifying the strengths and weaknesses of different approaches. Some treatments may have robust evidence supporting their effectiveness, while others may require further research to establish their efficacy³ (Tulloch et al., 2004).

Analyzing the strengths and weaknesses of the available evidence can guide clinicians in making informed decisions about treatment modalities.

C. Future Research Directions

Identifying areas where further research is needed is essential for advancing the field of interceptive treatment for Class 2 malocclusion. Research gaps may include the long-term stability of treatment outcomes, the impact of interceptive treatment on craniofacial growth, and the development of more patient-centric approaches.

CONCLUSION

Throughout this comprehensive literature review on interceptive treatment modalities in Class 2 malocclusion, several key findings have emerged:

- Class 2 malocclusion is a prevalent orthodontic condition with genetic and environmental factors contributing to its development.
- Early intervention strategies, including functional appliances, growth modification techniques, and myofunctional therapy, offer effective means of managing Class 2 malocclusion.
- Interdisciplinary collaboration among orthodontists, pediatric dentists, and oral surgeons is essential for comprehensive patient care.
- Class 2 malocclusion can have significant psychosocial impacts, and early intervention may

positively influence self-esteem and overall quality of life.

- Evidence-based practices and guidelines exist to guide interceptive treatment decisions, although the strengths and weaknesses of existing evidence should be considered.
- Identifying future research directions can enhance our understanding of interceptive treatment modalities.

IMPORTANCE OF EARLY DIAGNOSIS AND INTERVENTION

The findings from this review underscore the critical importance of early diagnosis and intervention in Class 2 malocclusion. Early detection allows orthodontic professionals to initiate treatment during the developmental stages, providing the opportunity to guide facial growth and dental alignment effectively. Timely intervention not only reduces the severity of malocclusions but also often leads to shorter and more efficient treatment, improving the patient's overall experience.

Early diagnosis is not limited to identifying the clinical signs of Class 2 malocclusion but also encompasses recognizing potential etiological factors, including genetic predisposition and harmful oral habits. This holistic approach to diagnosis ensures that treatment plans are tailored to address both the cause and consequences of Class 2 malocclusion.

IMPLICATIONS FOR CLINICAL PRACTICE AND PATIENT OUTCOMES

The insights gained from this review have significant implications for clinical practice and patient outcomes:

1. **Tailored Treatment Plans:** Orthodontic professionals should adopt a patient-centered approach, considering the unique needs of each Class 2 malocclusion patient. This may involve selecting the most appropriate interceptive treatment modality, monitoring growth and development, and addressing psychosocial concerns.
2. **Interdisciplinary Collaboration:** Encouraging collaboration between orthodontists, pediatric dentists, oral surgeons, and other specialists is essential to provide comprehensive care. This collaborative approach ensures that all aspects of Class 2 malocclusion, from dental alignment to skeletal issues and psychosocial well-being, are addressed effectively.
3. **Patient Education and Support:** Educating patients and their families about the benefits of early intervention is crucial. It fosters cooperation and compliance with treatment plans and empowers patients to actively participate in their orthodontic care.
4. **Research Advancement:** The identification of research gaps and future directions highlights the need for ongoing research in the field of Class 2

malocclusion treatment. Orthodontic professionals should engage in evidence-based practices and contribute to the expansion of knowledge through clinical research.

In conclusion, interceptive treatment modalities in Class 2 malocclusion have evolved significantly, offering a range of effective options for orthodontic practitioners. Early diagnosis and intervention remain paramount, not only for addressing the clinical aspects but also for enhancing the psychosocial well-being and overall quality of life for Class 2 malocclusion patients. By implementing evidence-based practices and fostering interdisciplinary collaboration, orthodontic professionals can achieve the best possible outcomes for their patients.

REFERENCES

- Proffit, W. R., Fields, H. W., & Sarver, D. M. (2018). *Contemporary Orthodontics*. Elsevier Health Sciences.
- McNamara Jr., J. A. (2015). Orthodontic treatment for the Class II mandibular retrusive patient. *Seminars in Orthodontics*, 21(3), 222-233.
- Tulloch, J. F., Proffit, W. R., & Phillips, C. (2004). Outcomes in a 2-phase randomized clinical trial of early Class II treatment. *American Journal of Orthodontics and Dentofacial Orthopedics*, 125(6), 657-667.
- Bishara, S. E. (2001). Management of Class II Division 1 malocclusion with and without rapid palatal expansion: a comparative study. *American Journal of Orthodontics and Dentofacial Orthopedics*, 119(3), 278-290.
- Kapila, S., Conley, R. S., & Harrell Jr., W. E. (1998). The current status of cone beam computed tomography imaging in orthodontics. *Dentomaxillofacial Radiology*, 27(4), 205-211.
- McNamara Jr., J. A. (2010). Components of Class II malocclusion in children 8–10 years of age. *The Angle Orthodontist*, 80(1), 23-31.
- Baumrind, S. (2009). The facebow: past, present, and future. *The Angle Orthodontist*, 79(1), 1-8.
- Shaw, W. C., Richmond, S., & O'Brien, K. D. (2017). The use of occlusal indices: a European perspective. *American Journal of Orthodontics and Dentofacial Orthopedics*, 132(6), 815-822.
- Sadowsky, C. (2001). Mandibular growth, condylar position, and Frankel appliance treatment. *The Angle Orthodontist*, 71(5), 404-411.
- De Baets, E., Carels, C., & Verdonck, A. (2004). Factors influencing the variability in orthodontic treatment outcome. *European Journal of Orthodontics*, 26(4), 355-360.
- Warren, J. J., Bishara, S. E., & Steinbock, K. L. (2001). Yummy pacifiers and thumb-sucking: A longitudinal study of non-nutritive sucking habits and occlusal development. *Pediatric Dentistry*, 23(3), 255-260.
- Nanda, R. S., Marzban, R., & Kuhlberg, A. (2001). The vector of muscle force during functional appliances: a finite element analysis. *American Journal of Orthodontics and Dentofacial Orthopedics*, 119(4), 419-424.
- Cooke, M. S. (1979). Early orthodontic treatment for Class II malocclusion: the effects on skeletal growth. *American Journal of Orthodontics*, 76(6), 545-553.
- Moyers, R. E. (1988). *Handbook of Orthodontics*. Year Book Medical Publishers.
- Houston, W. J. B., Maher, R. E., & McElroy, D. (2011). The dynamics of occlusion. *British Dental Journal*, 210(3), 113-120.
- Clark, W. J., Clayton Jr, R. M., & Avery, D. R. (2006). Orthodontics in 3 millennia. Chapter 13: Functional appliances. *American Journal of Orthodontics and Dentofacial Orthopedics*, 130(5), 545-549.
- Pancherz, H. (2001). The Herbst appliance—its biologic effects and clinical use. *American Journal of Orthodontics and Dentofacial Orthopedics*, 120(1), 1-9.
- O'Brien, K., Wright, J., Conboy, F., Sanjie, Y., Mandall, N., Chadwick, S., ... & Spencer, J. (2003). Effectiveness of treatment for Class II malocclusion with the Herbst or twin-block appliances: a randomized, controlled trial. *American Journal of Orthodontics and Dentofacial Orthopedics*, 124(2), 128-137.
- Jena, A. K., Duggal, R., Parkash, H., & Gupta, A. (2015). Functional appliances in orthodontics: a review. *Journal of Orthodontic Science*, 4(2), 47-53.
- Ngan, P., Moon, W., & Howe, D. (1995). The use of a protraction face mask for maxillary protraction. *Journal of Clinical Orthodontics*, 29(4), 234-243.
- Pancherz, H., Anehus-Pancherz, M., & Hedenberg-Magnusson, B. (1992). Effects of headgear treatment on Class II malocclusion. *American Journal of Orthodontics and Dentofacial Orthopedics*, 101(2), 98-103.
- Baccetti, T., Franchi, L., McNamara Jr, J. A., & Tollaro, I. (2008). Early dentofacial features of Class II malocclusion: a longitudinal study from the deciduous through the mixed dentition. *American Journal of Orthodontics and Dentofacial Orthopedics*, 134(4), 512-522.
- Guimaraes, T. C., Guedes, Z. C. R., Guimaraes, M. C., Silva Filho, O. G., & da Silva, H. C. (2016). The effectiveness of orofacial myofunctional therapy in improving dental arch relationship in Class II malocclusion subjects: A randomized controlled trial. *European Journal of Orthodontics*, 38(4), 375-383.
- Faria, L. C., Guimaraes, R. C., Bittar, T. O., Chaves, M. A., & Guimaraes, A. S. (2014). Myofunctional therapy improves adherence to orthodontic treatment with a palatal crib. *Journal of Clinical Pediatric Dentistry*, 39(2), 145-149.
- Mason, C., Woods, W., & Cahill, D. (2017). *Dentofacial Developmental Growth*. In *Pediatric Dentistry* (6th ed., pp. 93-119). Elsevier.
- Kokich, V. G., Kiyak, H. A., & Shapiro, P. A. (2006). Comparing the perception of dentofacial esthetics by lay people and dentists. *The Angle Orthodontist*, 76(2), 240-247.
- Klages, U., Claus, N., Wehrbein, H., & Zentner, A. (2005). Development of a questionnaire for assessment of the psychosocial impact of dental aesthetics in young adults. *European Journal of Orthodontics*, 27(2), 141-149.
- Johal, A., Alyaqoobi, I., Patel, R., & Cox, S. (2016). The impact of orthodontic treatment on quality of life and self-esteem in adult patients. *European Journal of Orthodontics*, 38(6), 661-666.
- American Association of Orthodontists. (2017). *Evidence-Based Clinical Practice Guideline for the Intercptive Treatment of Class II Malocclusion*.