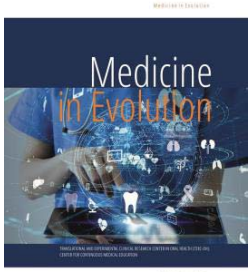
Patient satisfaction after treatment of Angle class II anomalies using the twin-block orthodontic appliance



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Abstract

The study aims to demonstrate the efficacy of the Twin-Block device in addressing various dental issues, including overjet, overbite, mandibular retrognathism, and facial aesthetics in children. A sample of 64 patients from a clinic in Arad, comprising both treated and ongoing cases with Class II Angle dental anomalies, was examined. Exo- and endo-buccal assessments were conducted to identify functional, pathological, and physiognomy issues, followed by radiological examinations and custom Twin-Block appliances. Of the 64 patients, 39 were female and 25 were male, aged 7 to 14 years. Sixty patients completed treatment, while four discontinued due to non-compliance. All patients exhibited Angle class II malocclusion, with overjet ranging from 7 to 10 mm and overbite from 2/3 to 3/3. Cephalometric analysis revealed ANB angles between 5° and 9°, SNA angles between 83° and 85°, and SNB angles between 75° and 78°. Treatment duration varied, with 91% completing the active phase in 6-9 months, followed by maintenance (3-6 months) and retention (9 months) phases, totaling up to 18 months. In 9% of cases, treatment duration exceeded expectations by 2-5 months. Following treatment completion, 53 patients expressed high satisfaction, seven were satisfied, and four were dissatisfied due to non-compliance with Twin-Block device requirements.

Keywords: class II Angle malocclusion, Twin Block appliance, orthodontic treatment, patient satisfaction

INTRODUCTION

Orthodontic treatment, aimed at correcting dental irregularities, encompasses a broader concept termed 'dental orthopaedics,' as coined by Sir Norman Bennett [1]. This term extends beyond mere dental correction to include the enhancement of facial development, although it lacks a precise definition in this regard. “Dentofacial orthopaedics”, a more encompassing term, not only addresses dental and orthopaedic concerns but also focuses on achieving facial harmony. By embracing this broader perspective, the field expands its scope, fostering a better understanding among the public regarding the aesthetic benefits of dentofacial treatments [2,3].

In cases where malocclusion stems from muscular or skeletal anomalies, orthopaedic interventions are necessary. Functional orthopaedic devices aim to rectify muscle imbalances and skeletal issues, particularly by correcting aberrant muscle conditions and restoring facial balance [4-7]. These interventions are rooted in the understanding of genetic influences on maxillofacial development, initially explored through studies utilizing tools like Broadbent's Cephalostat. This philosophical framework perceives bone structure as genetically determined, irrespective of environmental factors [7].

Functional orthopaedic treatment involves expanding and enhancing the upper arch to improve overall facial morphology. By repositioning the mandible in alignment with the upper jaw, it addresses issues like a retruded lower jaw and controls malocclusion during early development stages. Unlike traditional orthodontic approaches that focus on tooth movement, orthopaedic treatments prioritize altering jaw position to correct intermaxillary relations [8,9].

Studies examining forces exerted during jaw movement have highlighted the substantial pressures involved, particularly in cases of Class II malocclusion. Orthopaedic forces, which target jaw repositioning rather than individual tooth movement, distribute evenly across dental arches [5]. This approach minimizes the risk of exceeding the periodontal tissue's tolerance levels and focuses on optimizing muscle function, crucial for bone growth and remodeling [10].

Twin-Block appliances, comprising acrylic blocks, offer a continuous orthopaedic correction mechanism [5]. These devices facilitate rapid malocclusion correction by transmitting favorable occlusal forces through inclined planes onto posterior teeth [11,12]. By promoting protrusive mandibular function and modifying occlusal planes, they effectively address Class II malocclusion. Patients wear these appliances continuously for 24 hours to maximize functional forces, including those generated during chewing [5].

Post-treatment, patients experience notable facial improvements, including enhanced lip closure and facial balance, evident within the initial treatment phases. These changes are attributed to the swift adaptation of facial muscles to corrected occlusal functions. Moreover, dental improvements, such as distal occlusion correction, often manifest within six months of treatment initiation, underscoring the efficacy of Twin-Block devices compared to other functional appliances requiring removal during mastication [5,7].

Aim and objectives

The study aims to demonstrate the efficacy of the Twin-Block device in addressing various dental issues, including pronounced overjet or overbite, mandibular retrognathism, and the closure of vertical occlusion spaces. Additionally, it focuses on restoring both the normal and aesthetic facial appearance of the child. In contemporary dental medicine, the goal is to enhance patients' psychosocial well-being by providing aesthetic, functional, and healthy dental outcomes.

MATERIAL AND METHODS

For this investigation, we utilized a sample of 64 patients treated at a clinic in Arad. We extracted records of both treated and ongoing cases, specifically targeting those with Class II Angle dental anomalies requiring the functional Twin-Block appliance.

Initially, an exo- and endo-buccal examination was conducted to identify functional, pathological, and physiognomic issues. This assessment was followed by radiological examinations, including OPG and profile teleradiography, alongside cephalometric analysis. Subsequently, impressions of the oral cavity were taken, and plaster models were created to facilitate individualized treatment planning and the identification of dento-maxillary anomalies necessary for the fabrication of Twin-Block functional appliances.

The study findings were presented through graphical representations and tables, illustrating personal characteristics of the sample, treatment duration, patient compliance, and satisfaction levels.

RESULTS

Among the total sample, 39 were female and 25 were male, aged between 7 and 14 years. Sixty patients successfully completed the therapy, while four discontinued wearing the appliance at various intervals.

All patients exhibited Angle class II malocclusion, diagnosed through clinical and para-clinical assessments. Overjet measurements ranged from 7 to 10 mm, and overbite ranged between 2/3 and 3/3. Cephalometric analysis revealed ANB angles between 5° and 9°, SNA angles between 83° and 85°, and SNB angles between 75° and 78°.

Treatment duration varied among patients; however, our study found that in 91% of cases, the active phase lasted an average of 6-9 months, followed by a maintenance phase of 3-6 months, and a retention phase of 9 months. The total treatment duration, including retention, could extend up to 18 months. In 9% of cases, treatment exceeded the average duration by 2-5 months, attributed to patients' non-adherence to physician instructions or physiological factors affecting treatment progress.

Table 1. Treatment duration

TREATMENT DURATION	Patients (N)
18 months	58
> 18 months	6

Throughout the study, we noted a minor yet discernible portion of patients who discontinued wearing the Twin-Block device during the active phase, consequently hindering the completion of the initial treatment regimen. Approximately 6% of all patients displayed inconsistency in adhering to the orthodontist's directives, while the remaining 94% effectively fulfilled the prescribed treatment plan.

Additionally, post-study, I sought to delineate the oral hygiene standards among the treated patients. Seventy-five percent exhibited good hygiene, 16% demonstrated very good hygiene, and 9% presented with poor hygiene.

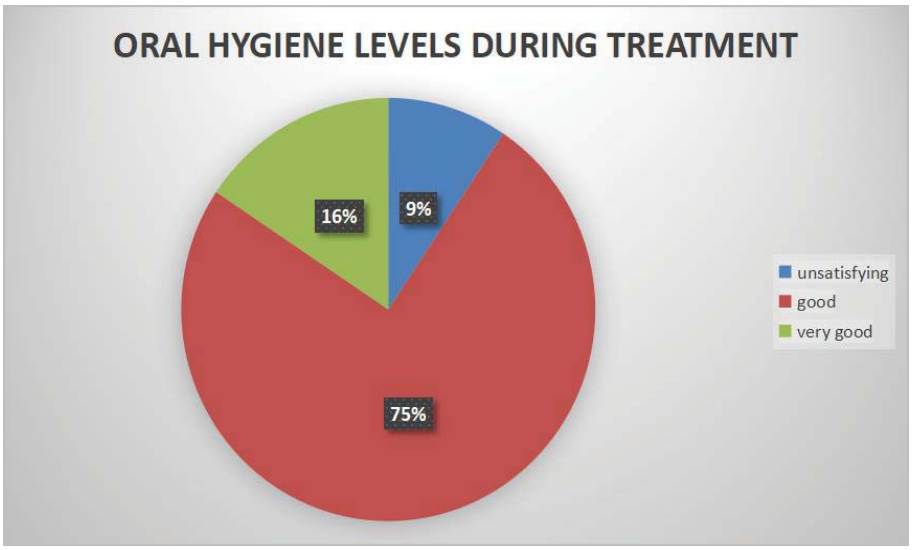

Figure 1. Oral hygiene of patients during the treatment period

Following the completion of the treatment period, 53 patients were very satisfied with the results obtained, 7 patients were satisfied and 4 of the patients were dissatisfied, the dissatisfaction arising after abandoning compliance with the requirements of wearing the Twin-Block device.

DISCUSSIONS

In the evolution of orthodontic techniques, fixed devices with multiple bands were developed for treating permanent dentition [13-15]. Traditionally, treatment was delayed until the eruption of canines and premolars, coinciding with the full development of malocclusion. This involved retracting the upper arch using orthodontic correction to achieve occlusal reconstruction.

However, in most Class II malocclusions, there is a lateral constriction of the upper jaw linked to the skull base, leading to insufficient development of the lower jaw. This bone problem cannot be adequately corrected solely by retracting the normal upper jaw if the lower jaw is deficient [14,16,17]. Mandibular bony deficiencies manifest early in dental and facial development. Orthopaedic treatment aims to correct bone relationships before malocclusion manifests in permanent dentition, potentially restoring normal function and facilitating correct occlusal relationships [17].

Functional treatment aims to expand and develop the upper arch, utilizing it as a template to reposition the mandible in alignment with the normal upper jaw. This early intervention addresses bony issues associated with a retracted lower jaw and controls malocclusion during developmental stages [18-20].

The role of inclined planes is crucial in establishing cuspid relationships and achieving occlusion during tooth eruption. A functional balance is established via neurological control responding to tactile stimuli. Occlusal forces transmitted through the dentition influence growth rate and supporting bone structure [19].

Malocclusion often stems from arch discrepancies due to bone and tissue factors, resulting in unfavorable cuspid orientation and defective occlusal function [19,20]. Functional appliances aim to improve dentofacial structural relationships by addressing unfavorable development factors and enhancing muscular conditions crucial for occlusal development [21].

In cases requiring Twin-Block functional devices for Class II anomalies, early diagnosis during childhood growth phases is imperative. This allows cranial bones to undergo changes, restoring desired aesthetic appearances and mitigating psycho-social impacts [22-24].

Post-study observations revealed a higher prevalence of this dental anomaly among females, though causative factors remain unclear. Additionally, fewer patients from rural areas sought orthodontic treatment, with only 27% originating from such regions, often correlating with poor oral hygiene. Increased education and awareness initiatives targeted at rural populations, particularly parents, are essential for improving oral health complacency.

Furthermore, while 94% of patients adhered to physician instructions, a notable 6% did not, often due to subjective or objective reasons. Identifying and addressing the causes behind non-compliance are crucial to reducing this percentage.

CONCLUSIONS

The satisfaction rate among patients who underwent treatment with Twin-Block functional appliances stands at 83%. This significant percentage underscores their recognition of the effectiveness and comfort provided by Twin-Block appliances compared to other orthodontic devices, which typically cannot be removed from the oral cavity until treatment completion.

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