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Twin Block Appliance - A Review

Dr. Padmavati.R [1], Dr. S.Muthuraman [2] , Dr. M.S.Kannan [3]

[1]Senior Lecturer, Department of Orthodontics, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Chennai.*
[2]Undergraduate student, Sree Balaji Dental College and Hospital, Bharath Institute of Higher Education and Research, Chennai.
[3]Professor and HOD, Department of Orthodontics,Sree Balaji Dental College and Hospital,Bharath Institute of Higher Education and Research,Chennai.

Abstract: Twin block appliance is mostly used for correction of class II malocclusion part with mandibular skeletal retrusion. This appliance uses the force of occlusion of teeth, the most natural functional mechanism to initiate bone remodelling process for functional correction of malocclusion. Twin block is a functional appliance which is designed to enhance mandibular forward growth in the treatment of distal malocclusion by encouraging a functional displacement of mandibular condylar downward and forward in glenoid fossa. It is composed of distinct upper and lower units which are not joined together. It is efficiently used as it plays a major role in achieving rapid functional correction of malocclusions by transmitting favourable occlusal forces to occlusal inclined planes that cover all posterior teeth. Considerable forces are applied to the muscle of mastication and the teeth. On undergoing this force internal and the external basal bone are severely influenced.

Key words: Class II malocclusion, Magnetic twin block, Inclined plane

INTRODUCTION

The twin block appliance is a two-piece functional appliance. They are bite-blocks that effectively modify the occlusal inclined plane to induce favourably directed occlusal forces by causing a functional mandibular displacement. The appliance was designed to be worn for 24hrs. The Twin block is a smart modification of Schwartz double plate and the split activator. It is a widely accepted and popular functional appliance.

HISTORY

The twin block was initially developed by William Clark for the treatment of class II malocclusions[1]. The day on which it was used was September 7,1977. This appliance came into evolution in response to a clinical problem. A young patient Colin Gove, whose father is a dentist, fell and completely luxated an upper central incisor. Fortunately, he kept the tooth and within few hours of the accident the tooth was reimplanted using temporary splint and later on with stabilizing splint. It is also employed to prevent lip trap and also to prevent direct pressure on upper incisor. This appliance was actually designed to ensure the forward posture of mandible. Repositioning creates a positive proprioceptive response in the muscles of mastication.

PRINCIPLE

It is based on maximising the growth response to functional mandibular protrusion by using this appliance. Considerable forces are applied through the muscles of mastication to the teeth and the underlying bony structures to influence both the internal and the external structure of the basal bone. Unfavourable cuspal contact during distal occlusions replaced by favourable proprioceptive contact on the inclined plane of the twin block to rectify the malocclusion.

ANGULATION

Angulation of the inclined plane is the key factor for the fabrication of the inclined plane[2]. Initially the angulation between the blocks were made at 90 degree. Since it was a quite difficult task to hold the mandible forward at this angle and hence it was modified to 45 degrees. In due course of time the angulation was changed to 70 degrees to the actual plane, in order to apply more horizontal force which in turn encourages more forward mandibular growth.

PHASES OF TREATMENT
ACTIVE PHASE

- Sagittal correction
- Vertical correction
- Correction of occlusion

SUPPORT PHASE

- The purpose of this phase is to retain the corrected incisor relationship until buccal side occlusion is established.
- Upper removeable appliance with steep anterior inclined guide plane.
- Vertical control is essential in support phase after reduction of overbite.

RETENTIVE PHASE

- Treatment is followed by retention of the upper anterior inclined plane appliance.
- Wearing the appliance is reduced to night time wear only after the occlusion is fully established.
- A good buccal segment occlusion is the key factor of stability after correction of arch to arch relationship.

TREATMENT TIME

The treatment time for active phase vary from 6 to 9 months; the treatment time for support phase vary from 3 to 6 months and the treatment time for retentive phase is 9 months.

- The wear time gradually decreases.
- TOTAL TIME = 18 MONTHS (inclusive of all retention period)

DESIGN OF TWIN BLOCK

The earliest twin blocks were designed with the following components:[3] Midline screws to expand the upper arch. Occlusal bite blocks. Adams clasps on upper molars and premolars. Adams clasp on lower premolars. Interdental/ball end clasps on lower incisors. Provides additional retention and are essential if the labial bow is not used. They are placed interdentally. In the maxillary appliance additional ball clasps are placed interdentally distal to canines, or between the premolars or deciduous molars. The mandibular appliance is retained with ball end clasps mesial to canines.

Labial bow to retract the upper incisors

Yaqoob et al[4] in 2012 conducted a randomized controlled trial using Clark's twin block functional appliance with and without an upper labial bow and the results concluded that the addition of a maxillary labial bow to the Clark's Twin Block has no influence on dentoalveolar or skeletal changes, or on rate of overjet reduction, in relation to appliance therapy. Springs to move individual teeth and improve the arch form Provision for extraoral traction in treatment of maxillary protrusion. The delta clasp was designed by Clark in 1985 to enhance the fixation of twin blocks. It is similar in principle to the modified arrow head clasp (Adams 1949) but incorporates new features to improve retention, minimize adjustment and reduce metal fatigue, thereby reducing breakage. The Delta clasp retains the basic shape of the Adams clasp with interdental tags, retentive loops and buccal bridge. The essential difference is in the retentive loops, which are shaped as a closed triangle as opposed to an open V-shaped loop in the Adams clasp. Alternatively, the arrowhead may be circular or ovoid in shape if preferred. The Delta clasp does not open with repeated insertion and removal, and therefore maintains better retention, and requires less adjustment. A further crucial advantage is that the clasp gives excellent retention on lower premolars, and can be used on most posterior teeth.

OCCLUSAL INCLINED PLANE

The occlusal inclined plane is the fundamental functional mechanism of dentition[5]. Occlusal forces transmitted from the dentition will influence the rate of growth and trabecular structure of supporting bone. This sensory feedback mechanism provides a functional stimulus to mandibular bone growth.

BITE REGISTRATION

In a deep bite case blue project gauge is used and bite is registered with an interincisal clearance of 2mm ,5-6mm clearance in interpremolar/deciduous molar region, 1-2mm clearance in the molar region. Bite is opened beyond the freeway space, so that the patient cannot retrude the mandible when in rest position, but the blocks are not made too thick so that the patient can eat and speak comfortably with the appliances in the mouth. In case of an open bite the inter-incisal clearance is maintained at 4mm and the objective is to open the bite beyond freeway space so as to intrude the posterior teeth, without making the blocks too thick.[6]

RESPONSE TO TWIN BLOCK TREATMENT

When the mandible posture is downward and forward there is an area of immense cellular activity above and behind the condyle referred as tension zone[7]. This area is quickly involved by proliferative blood vessels and connective tissue. New position of muscle response will be established where the patient will find it difficult to retract the mandible to the former retruded position. Baccetti et al[8](2000) in a cephalometric study evaluated the optimum treatment timing for twin block treatment. Skeletal maturity in individual patients was assessed on the basis of cervical vertebrae maturation stages. Findings of this study indicated that optimal timing for Twin-block therapy of Class II disharmony is during or slightly after the onset of the pubertal peak in growth velocity. Late twin block therapy lead to enhanced mandibular lengthening and reduced forward displacement of the condyle in favor of effective skeletal changes.

PTERYGOID RESPONSE

After the appliance is given to the patient, it will alter the muscle balance. So that it will become painful for the patient to retract the mandible. This is described as pterygoid response or formation of tension zone distal to condyle[9].

MODIFICATIONS OF TWIN BLOCK

Magnetic twin block[10]

- Usage of magnet in twin block help us to accelerate correction of arch relationships. Types of magnets used

Rare earth magnets are used

- Samarium cobalt
- Neodymium boron

Attracting Magnet

It pulls the appliances together and encourages the patient to occlude activity and consistently in forward position:
Indication: patient with weak musculature.

Repelling magnet

They deliver additional forward mandibular poster without reactivation of blocks.

Twin block hyrax appliance

Transvers development can be combined with mandibular advancement by adding twin block appliance with rapid palatal expansion appliance like hyrax screw.

SKELETAL CHANGES IN TWIN BLOCK THERAPY

- Forward growth or repositioning of the mandible is seen after twin block therapy.
- Increase in SNB angle.
- Little change in SNB angle indicating maxillary restraint but was not detected because of dentoalveolar remodeling disguising skeletal effect.
- Forward growth or repositioning of mandible does result in significant change in ANB thus severity of class II skeletal pattern is reduced.
- Increase in lower anterior facial height.

DENTAL CHANGES

- Overjet reduction.
- Retroclination of upper incisors.
- Proclination of lower incisors.
- Buccal segment correction occurred by distal movement of the upper molars.
- Lower molar eruption is an anterior oral superior direction.

INDICATION

- Permanent dentition and active grower.
- Uncrowded dentition.
- 10 mm or less overjet with normal deep overbite.
- Normal growth direction.
- If patient of class II div 2 with limited overjet or class II div 1 with crowded and irregular incisors, align the upper incisors with a fixed or removable appliance before starting a twin block.

CONTRAINDICATION

- Class II Skeletal by maxillary prognathism.
- Vertically directed grower.
- Labial tipping of lower incisors.
- Crowding.

MODIFICATION
TWIN BLOCK FOR ARCH DEVELOPMENT[11]

- TRANSVERSE DEVELOPMENT
- SAGITTAL DEVELOPMENT
- SAGITTAL AND TRANSVERSE DEVELOPMENT
- TO CLOSE ANTERIOR OPEN BITE

Parkin NA at al[12] in 2001 compared the two modifications of Twin block appliance in Class II samples. The study compared the skeletal and dental changes contributing to Class II correction with 2 modifications of the Twin-block appliance: Twin-block appliances that use a labial bow and Twin-block appliance that incorporate high-pull headgear and torquing spurs on

the maxillary central incisors. Both types of the Twin-block appliance were very effective in correcting Class II malocclusions. Dentoalveolar tipping occurred in both groups and the addition of high-pull headgear to the Twin block allowed effective vertical and sagittal control of the maxilla and, consequently, there was no increase in the LFH/TAFH ratio.

TREATMENT OF CLASS II DIV 2

- Retro inclined upper incisors are responsible for holding the mandible in distal position in angles class II div 2 malocclusion.
- Construction bite is registered with incisors in edge to edge occlusion.
- Vertical development is the primary factor in correction of class II DIV 2 malocclusion with minimum advancement of mandible.
- In class II div 2 malocclusion retruded incisors are the main cause for retruded mandible.
- Retruded incisors are corrected by giving 2/4 appliance.
- The 2/4 is a fixed appliance which is made of bands on first permanent molar and bonded to erupted permanent incisors.
- Thereby correction of retruded incisors will enable the mandible to advance, after twin block appliance is given.

TREATMENT OF CLASS III MALOCCLUSION

- The position of bite blocks re reversed when compared to twin blocks for class II treatment.
- Designed to encourage maxillary development by action of reverse occlusal inclined planes cut at 70 degrees.

Minase et al[13] in 2019 compared the effectiveness of reverse twin block with lip pads-RME and face mask with RME in the early treatment of class III malocclusion. Both groups were effective in correcting the malocclusion, but reverse twin block with lip pads-RME appliance had nonsignificant but greater impact on maxillary advancement and more hold on the posterior positioning of the mandible with minimal dental compensation as compared to Facemask-RME appliance.

TREATMENT OF FACIAL SYMMETRY

- Sagittal twin blocks give better control for the correlation of dental or facial symmetry.

ADULT TREATMENT

- Twin block can be used in mild discrepancies in adult.
- But in severe skeletal discrepancies, twin blocks are contraindicated and orthognathic surgery is a treatment of choice in adult patients.

TWIN BLOCK REACTIVATION

Most functional appliances can only be reactivated by laboratory reconstruction or adjustments, or by time consuming chairside additions of acrylic, with the accompanying risk of loose monomer in the intraoral cavity. A modified twin-block appliance allows controlled, stepwise bite advancements to be carried out easily at the chair. Advancement screws are incorporated in the maxillary appliance blocks and activated by the insertion of cylindrical acetyl. Resin spacers of various thicknesses. Bite reactivations of as much as 7mm can be readily achieved using the standard 12mm advancement screws. For greater activations, the longer 16mm or 20mm screws may be required.[14]

RECENT ADVANCES

Patterson et al[15] in AJODO 2020 evaluated if Class II malocclusion can be treated with clear aligners after completing treatment with the initial set of aligners. Two groups with subjects having Class I and Class II malocclusions were compared. No improvements were observed in AP correction in patients with Class II malocclusion when correction was attempted with Class II elastics along with aligners. The Invisalign system successfully achieved certain tooth movements and improved the total ABO score yet the aligners warranted additional refinements and increased treatment duration.

CONCLUSION

Facial harmony and balance are of equal importance to the dental occlusion. One cannot ignore the importance of Orthopaedic techniques in achieving these goals by growth guidance during the formative years of facial development. The integration of Orthopaedic techniques offers a new initiative in restoring facial balance.

CONFLICT OF INTEREST

Conflict of interest declared none.

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