



Myofunctional Appliances

(Twin Block Example)

A Continued Education Lecture
Department of Orthodontics, College of Dentistry, University of Baghdad

Assist. Prof. Dr. Mehdi Abdulhadi Alrubayee
BDS, MSc Surg, MSc Ortho, PhD Ortho(UK)

Definitions

Treatment	Appliance	Target
Orthodontic	Fixed/removable	PDL proprioceptive fibers/teeth
Orthopedic	EOT/Headgear, chin cup and reversed headgear	Periosteum/bone remodeling+ PDL
Functional/ Myofunctional Orthopedic	Frankel/ Twin Block, Herbst...	

What is functional appliance?

A removable or fixed interceptive orthodontic appliance usually used in class II div1

utilizes or eliminates forces of facial muscles and muscles of mastication

modifies the growth at the maximum pre-pubertal age

by posturing the mandible forward and restraining the maxillary growth

History of functional appliances

“bone development might be adapted to functional and nutritional stimuli”

Wilhelm Roux (1881)

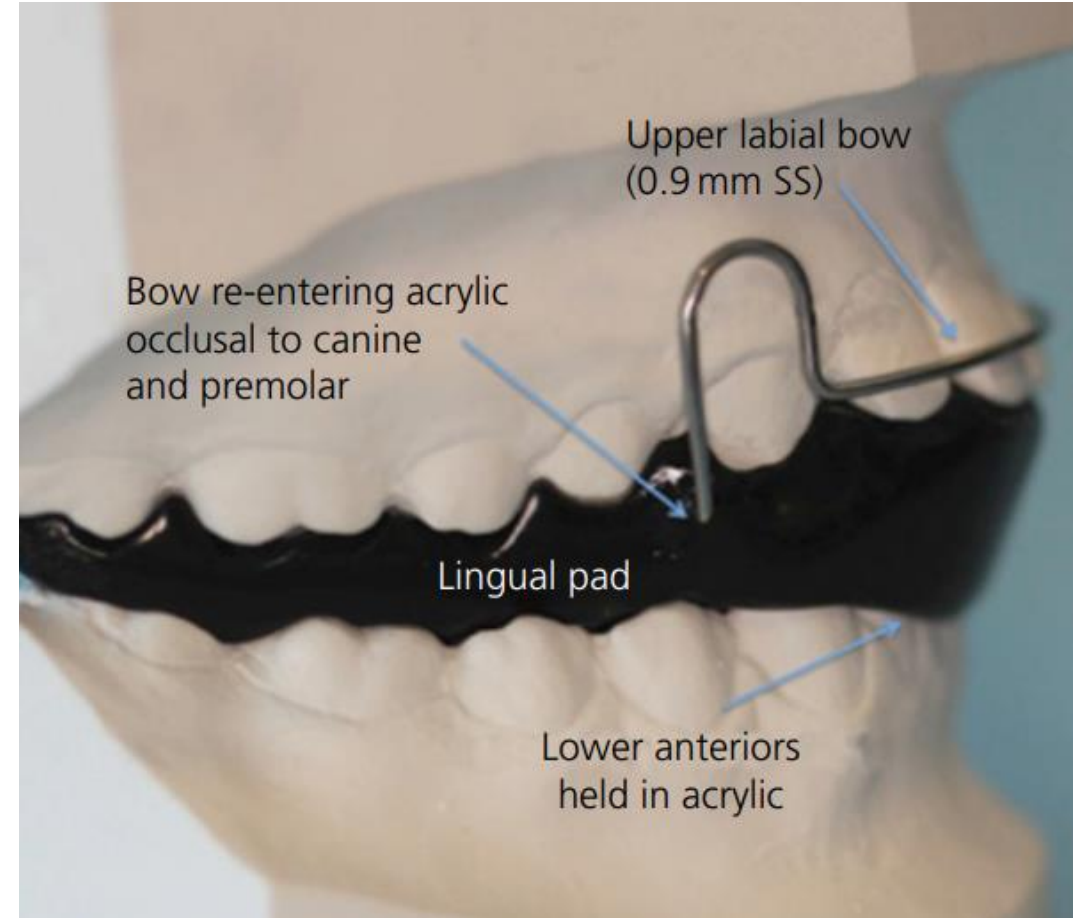
- origin in Europe
- use of precious metal alloys was banned due to World Wars
- functional appliances freshened as alternative solution.
- role of Pierre Robin
- Edward Angle made a modification to molar bands to posture the mandible forward to address Class II occlusion
- Nowadays, removable functional appliance more popular in Europe but in US fixed ones

Myofunctional jaw orthopedic appliances

Activator

Originated by Andresen and Karl Haupl in Norway in 1908 and subsequently popularized as the Andresen–Häupl appliance.

- Rigid
- tooth-borne
- **bulky appliance**
- loosely fitting
- Has grooves to produce mesial tipping of lower teeth and distal tipping of upper posterior teeth



Bionator

- Wilhelm Balters developed a reduced bulk activator
- It was a one-piece appliance
- The upper and lower components were joined together by a rigid wire

A little agreement in literature on the skeletal effects that this appliance may achieve



Functional regulator

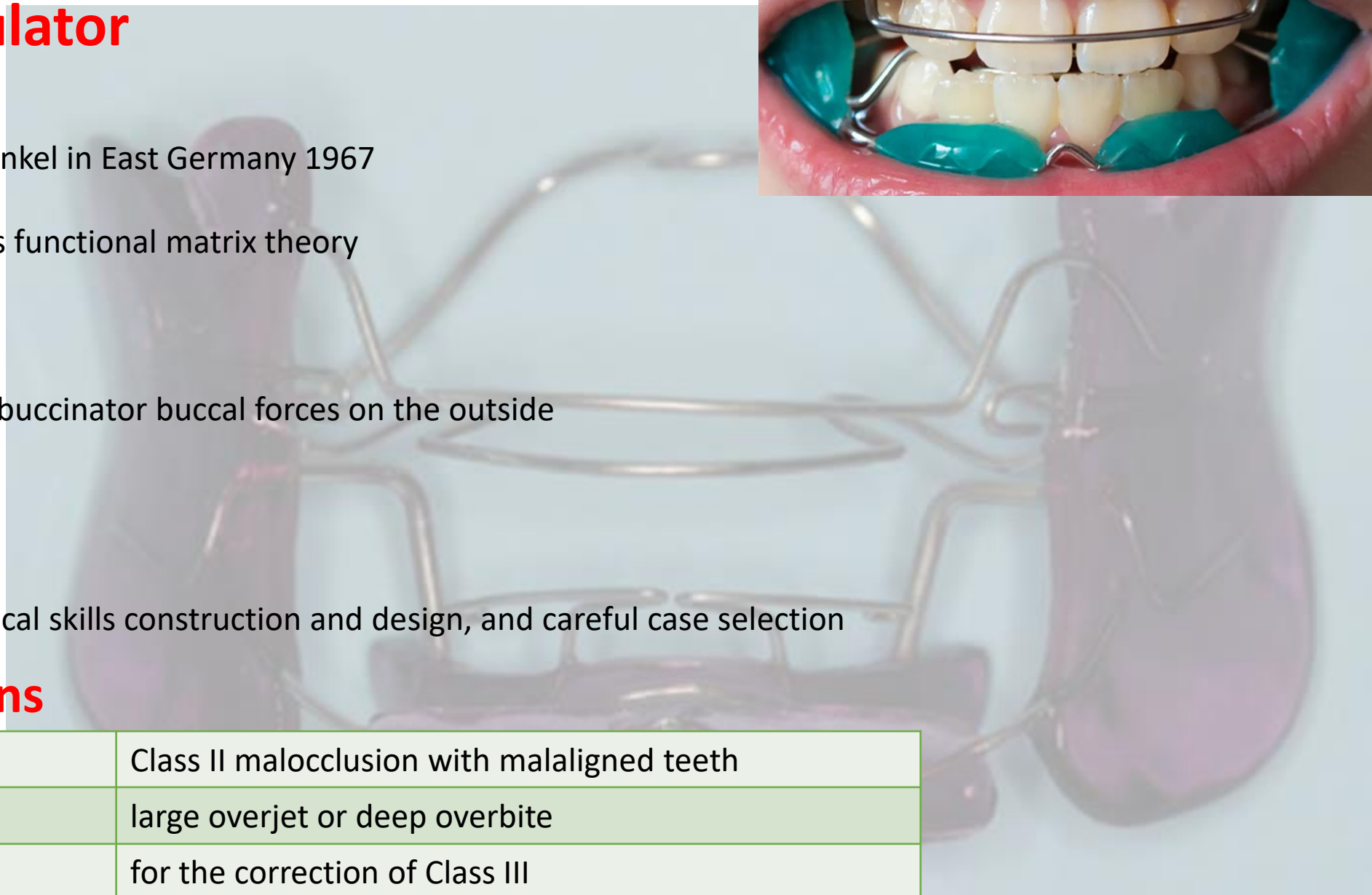
- developed by Dr Rolf Fränkel in East Germany 1967
- Dr Fränkel adopted Moss functional matrix theory
- tissue-borne appliance
- buccal shields eliminate buccinator buccal forces on the outside
- rarely used

Limitations

patient cooperation, technical skills construction and design, and careful case selection

4 versions

FR1	Class II malocclusion with malaligned teeth
FR2	large overjet or deep overbite
FR3	for the correction of Class III
FR4	for the correction of anterior open bite



Fixed functional appliances

advantages

- less patient compliance
- offer 24-hour wear under forces of mastication
- enabling the clinician to bond fixed orthodontic appliance

disadvantage

- risk of fatigue and breakage.

Herbst appliance

- the most popular in the US and parts of Europe
- Developed in 1905 by Herbst but popularized 1970 by Pancherz
- Fixed upper and lower **splints** with an interconnecting **piston**

Disadvantages

It is robust/rigid but still subjected to breakage of piston mechanism due to masticatory lateral excursions



HOW WORKS?

All functional appliance used in Class II correction involve:

- stretching of the tissues
- transmission of forces from the stretched muscles through the appliance to the dentition
- restraint of maxillary growth with full-time wear
- forward posturing the mandible by remodeling/associated changes in the position of the glenoid fossa and condyle

WHEN WORKS?

Craniofacial growth

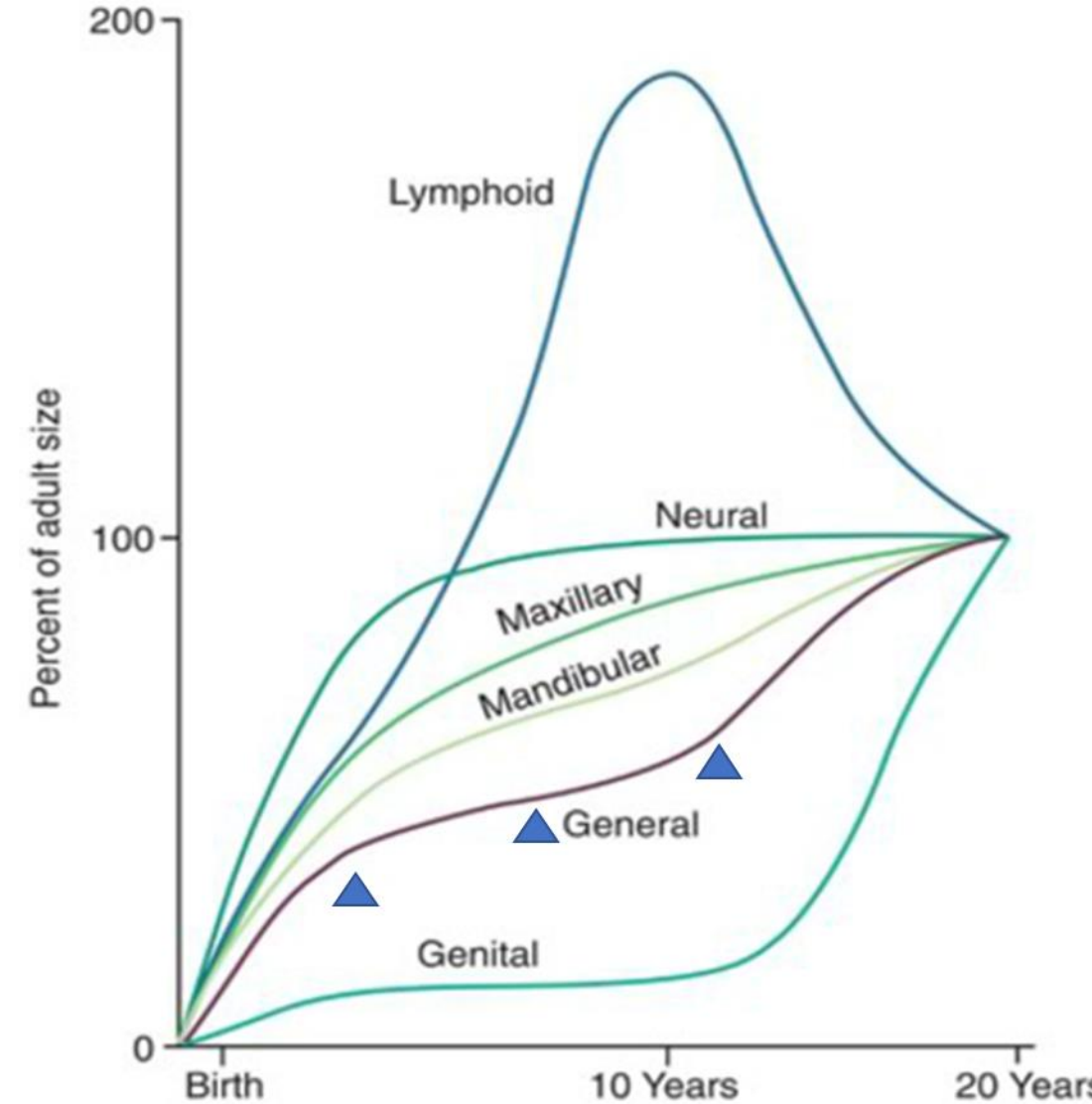
Both maxilla and mandible develop from intra membraneous ossification

But different in:

- timing
- curve of events

□ growth spurts are 3

Arbitrarily chronological age of 10 to 13 years in females and 11 to 14 years in males is **acceptable as pubertal growth spurt**

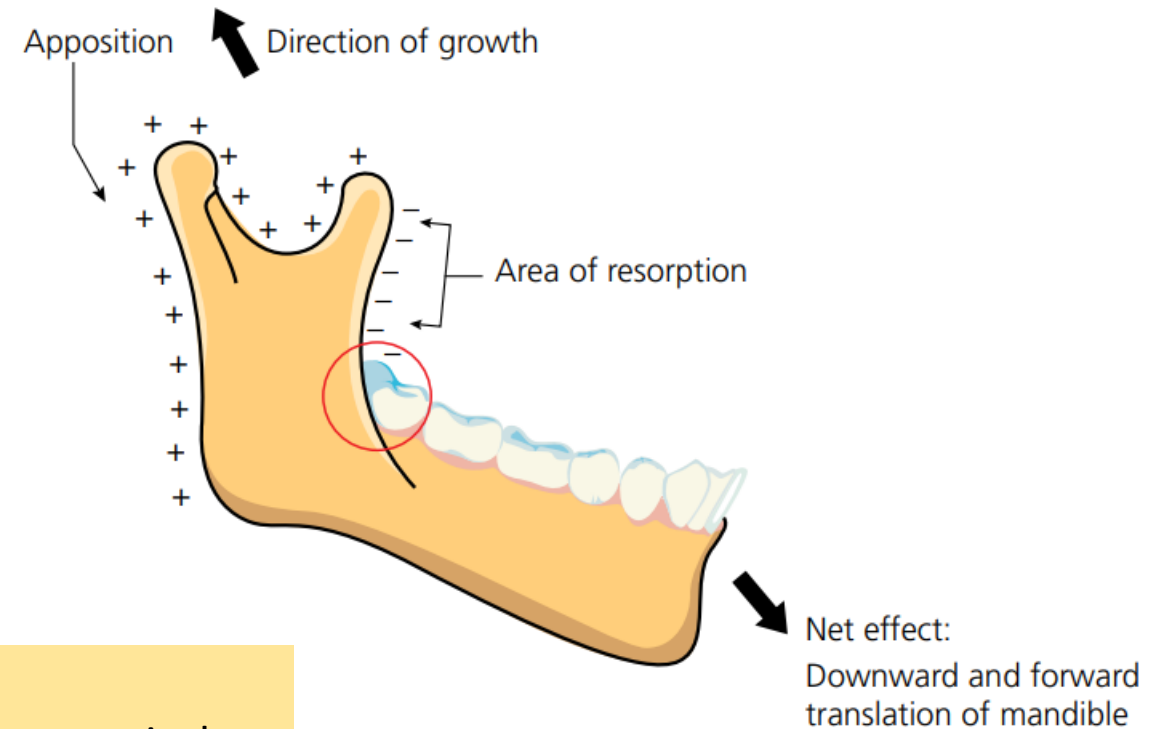


SCAMMON CURVE

Genetic vs epigenetic control

Controversy/debate between 2 schools:

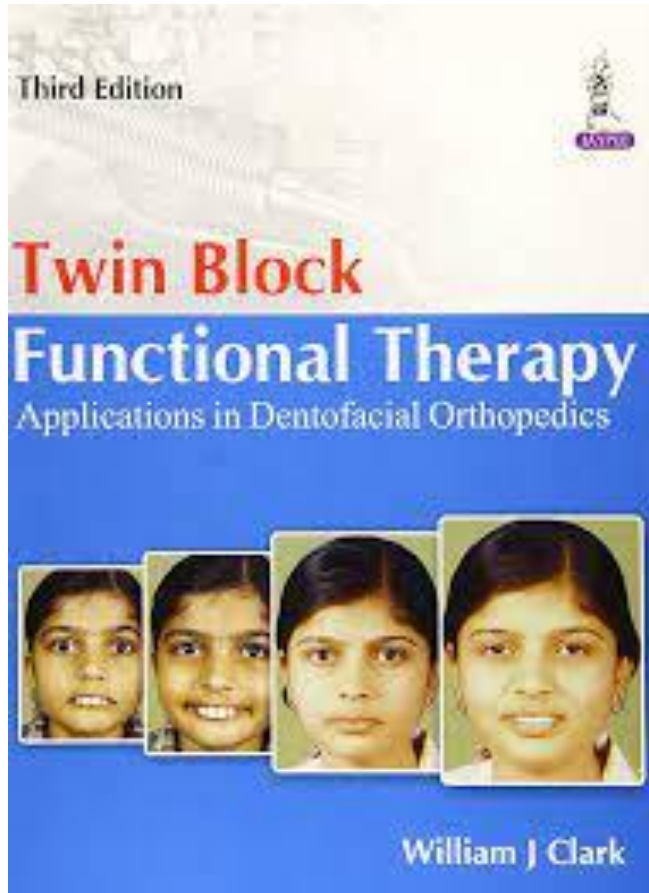
- Classic: strict genetic control (**primary growth center**)
- Moss functional matrix hypothesis: epigenetic (indirect genetic control) affected by **soft tissues matrix signals**
- Proffit suggests that maxilla growth → interlocking of the occlusion → mandibular forward translation



Net results are downward forward rotation via:

- 1- condylar growth in a posterior and superior direction leads to vertical displacement
- 2- resorption / deposition (remodeling) leads to forward movement of the ramus

TWIN BLOCK



Developed by William Clark in 1977
Dundee University/ Scotland/UK

Twin Block
Functional Therapy
Applications in Dentofacial Orthopedics

Twin Block Functional Therapy: Applications in Dentofacial Orthopedics, Third Edition, presents dentofacial orthopedics as the treatment of choice for the many dental malocclusions that result from abnormal skeletal development. Clearly written, with more than 2500 high-quality photographs, line drawings, and 80 illustrative patient case reports, this text will provide the orthodontist with a clear and practical account of the use of this comfortable, aesthetic, and efficient appliance.


New in this Edition

New Horizons in Orthodontics

- A new design for Fixed Twin Blocks, using the forces of occlusion to correct the malocclusion. The new clinical protocol is sublimely simple to apply at chairside or in the laboratory. This is the ultimate solution for dentofacial orthopedic correction of Class II malocclusion
- Invisible "Breathe Easy Twin Blocks" in effective treatment of sleep apnea
- A review of the new range of fixed functional appliances and their effects, advantages and disadvantages
- TransForce Lingual Appliances for excellence in interceptive treatment and arch development from mixed dentition to adult therapy


Advancing the Future of Orthodontics

William J. Clark BDS, DDO, DDC, FDS (Eng) has 50 years' experience in orthodontic practice. In 1977 he developed Twin Blocks for mandibular advancement, and in 2004, TransForce appliances for lingual arch development. His courses on "New Horizons in Orthodontics" offer practical advice on diagnosis, treatment planning and clinical management in fixed and functional appliance therapy. Dr Clark is the first recipient of an award of distinction from the British Orthodontic Society for an outstanding contribution to the specialty of orthodontics. In 2008 he received an award from the International Functional Association for personal outstanding international service to functionalism and orthodontics. He is the author of three new e-books: *Advances in Fixed Appliance Technique*, *Advances in Functional Therapy and Dentofacial Orthopaedics*, and *Faces and Braces*.




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ORTHODONTICS

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Twin Block

- *The story of its invention*
- most popular functional appliance in the UK
- primarily aimed at correction of mandibular retrognathia
- largely alternative to functional regulators and activators
- subject of a number of controlled clinical trials due to its effectiveness



Evidence-based Twin Block

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Outline
Abstract
Subjects and methods
Results
Discussion
Conclusion
Acknowledgements
References

American Journal of Orthodontics and Dentofacial Orthopedics
Volume 118, Issue 2, August 2006, Pages 159-170

Digital Article
Treatment timing for Twin-block therapy*

Tiziana Baccetti DDS, PhD, Lorenzo Franchi DDS, PhD, Linda Battrer Teth DDS, MSP, James A. McHughara Jr DDS, et al.

Design and management of Twin Blocks: reflections after 30 years of clinical use
William J. Clark

Readers' Forum Letter to the Editor | VOLUME 106, ISSUE 3, P206, SEPTEMBER 01, 2019

Twin Blocks designed for 24-hour wear
William J. Clark
DOI: <https://doi.org/10.1016/j.ajodo.2019.05.006>

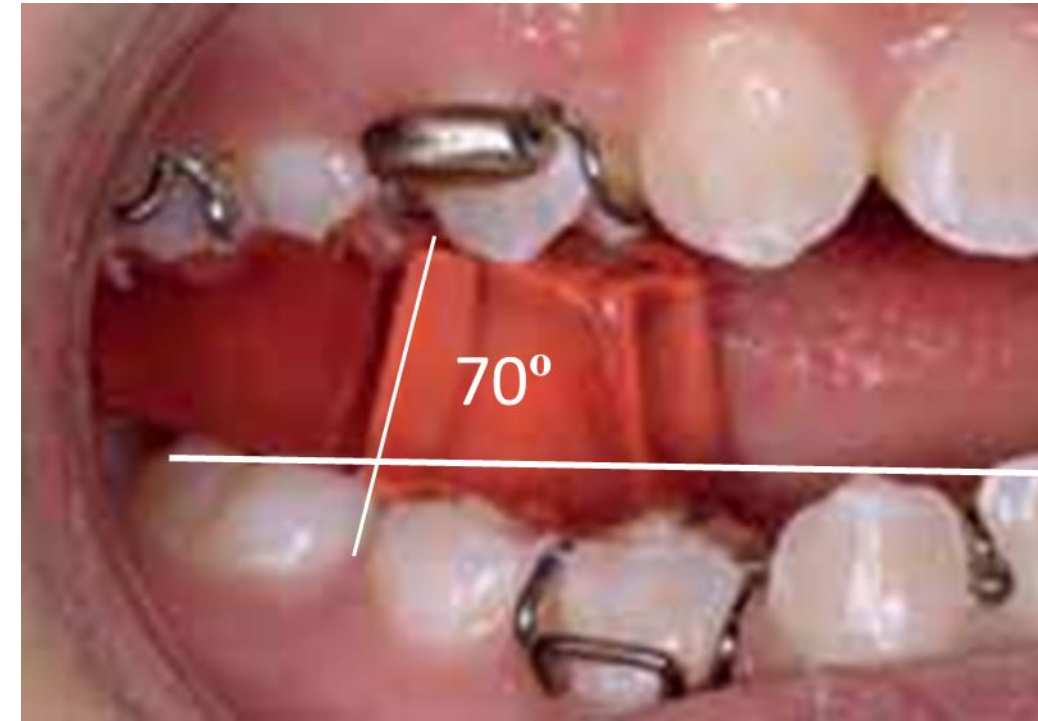
As the originator of Twin Blocks, I wish to contest the protocol and advice presented in the randomized clinical trial (RCT) on Twin Block therapy published in the February issue (Parekh J, Counihan K, Fleming PS, Pandis N, Sharma PK. Effectiveness of twin block vs. full-time wear appliances of Twin Block appliance on dental and skeletal changes in mandibular

Component parts and design

First the inclined plane was set at 45 degrees, Clark subsequently modified the design to increase the depth of the blocks, which are now set at approximately 70 degrees with the occlusal plane



More horizontal force



Advantages of Twin Block

1- Efficiency: Overjet reduction is typically rapid < 6 months.



- straightening of the profile
- reduction in facial convexity

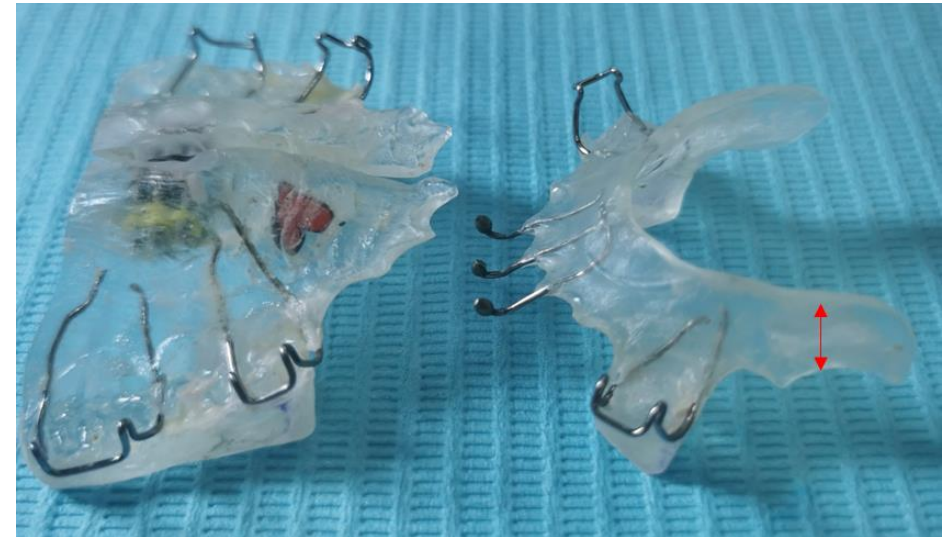


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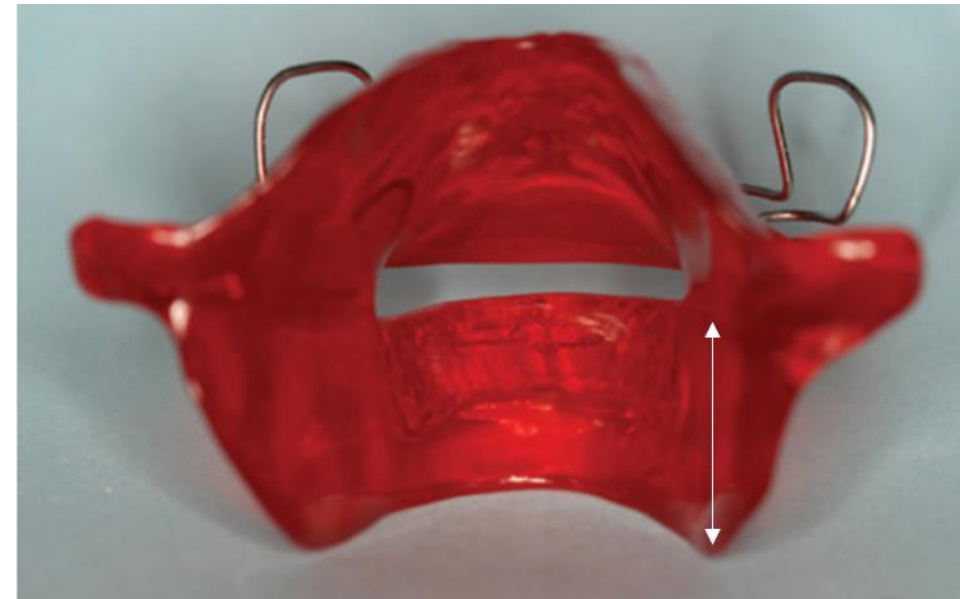
2- Less visible and potentially more comfortable in comparison to other functional appliances



3 - Simplicity and low cost



4- well-extended lower impressions with adequate lingual depth not required

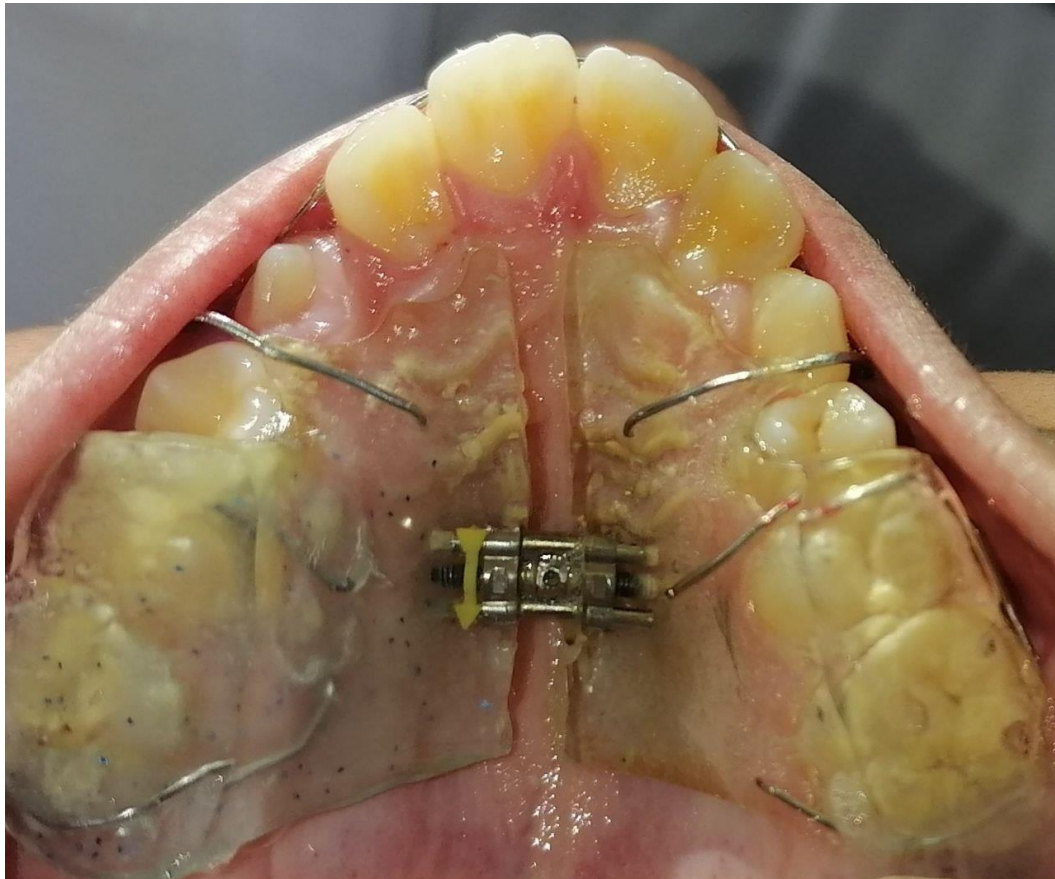


5- Good patient tolerance/Twin Block- induced tolerance

6- Lip trainer

7- Versatility:

It allows concomitant expansion, and there is the ability to add headgear and to vary the design depending on vertical skeletal and occlusal requirements.



Case selection

- when the forward posture of the mandible is aesthetically desirable
- late mixed or early permanent dentition, as there are sufficient erupted teeth to anchor and retain the appliance
- preferable, complete eruption of the 4s /upper 6s is desirable to allow optimal retention of the appliance
- patients should ideally be sufficiently mature to understand the objective of the appliance and the requirement to establish a forward habitual posture

Limitations

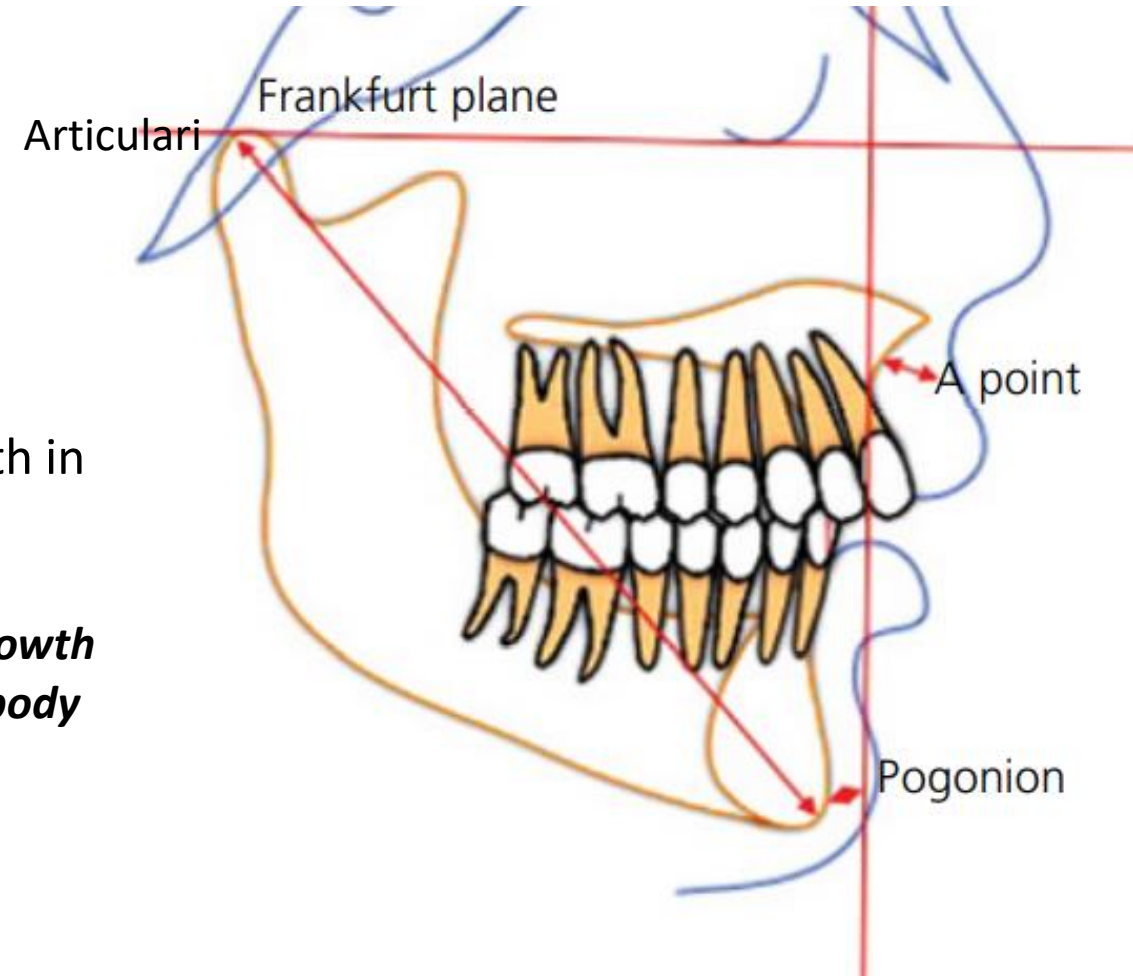
- removable nature
- excellent compliance to achieve Class II correction
- limited capacity to integrate with fixed appliances



Is the mandible length increasing in response to Twin Block

Woodside et al (1987) found that activation of the appliance by 7–10 mm resulted in **postural** forward movement of the mandible without significant growth in its length.

Mossey (2016) stated *“it is not possible to stimulate growth to produce an ultimate increase in mandibular ramus or body length beyond that which is genetically predetermined”*.



What may happen in the glenoid fossa?

The visco-elastic theory

The condylar cartilage is a secondary cartilage capable of **regional adaptive growth**, contrasting with primary long-bone epiphyseal articular cartilages

“condyle is unique and acts as the ‘pacemaker and organizer of mandibular growth”

Sarnat and Robinson

EFFECT OF THE APPLIANCE ON THE SOFT TISSUES



1-deep labio-mental fold will be flattened

2- anterior oral seal development

3-incompetent lips associated with a lower lip trap behind the maxillary incisors tends to improve resulting in a prolonged stability

4-however, lip incompetence without a lip trap due to increased vertical skeletal dimension, interfering with the response to Twin Block therapy.



MSc
Russul

Contraindication

If the forward posture produces **excessive lip incompetence**, it is likely that the anterior vertical facial dimension is increased, and a Twin Block is unlikely to be appropriate.



Nevertheless, in these patients:

- restraint of vertical maxillary growth should be attempted
- encourage a more horizontal vector of forward mandibular growth by
- restricting downward–backward mandibular rotation and adjunctive use of **orthopedic headgear**



An example of cautious use of Twin Block in patient with maxillary growth excess

- straightening of the profile
- reduction in facial convexity



Before



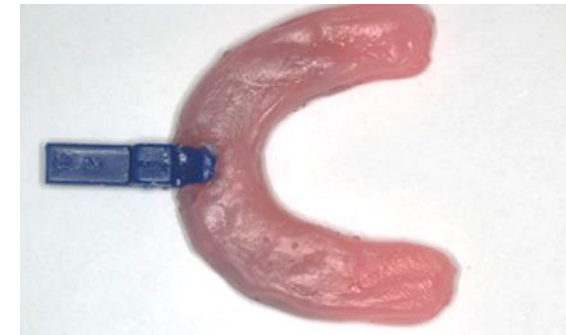
After

MSc Hibba

Bite registration

Correct appliance positioning requires that the lower block engages anterior to the upper block to maintain the forward posture of the mandible

Using **EXACTOBITE**, bite should be registered when opened beyond the freeway space, and the posterior teeth are 5mm or more out of occlusion



EXACTOBITE



Appliance Insertion

- The upper and lower components are fitted separately and the retention of each is checked.
- The patient should be able comfortably to position the mandible downward and forward with lower block in front of the upper.

Troubleshooting

Uncomfortable wearing may be due to too deep or the protrusion is excessive

- 1- reduce the height of one or both blocks
- 2- Ideally it is better re-register the bite



Wearing time

- Because Twin Block is patient friendly appliance, full-time wear from the beginning is desirable.
- However, often the appliance is removed for eating initially and then worn full time after the first follow-up appointment.

Single step vs 2 steps advancement

- Considerable debate and disagreement have surrounded the merits of incremental/gradual mandibular advancement manner versus one-step advancement.
- Intuitively, it would be expected that larger initial advancement may result in greater soft tissue stretch, leading to more pronounced dental changes than with more gradual advancement.
- It appears, however, **on the basis of prospective research that little difference** in the relative proportion of skeletal to dento-alveolar effects is likely with either approach



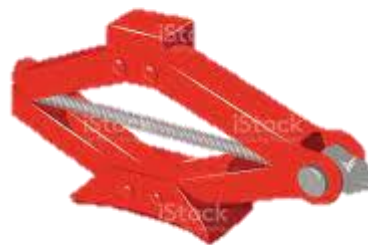
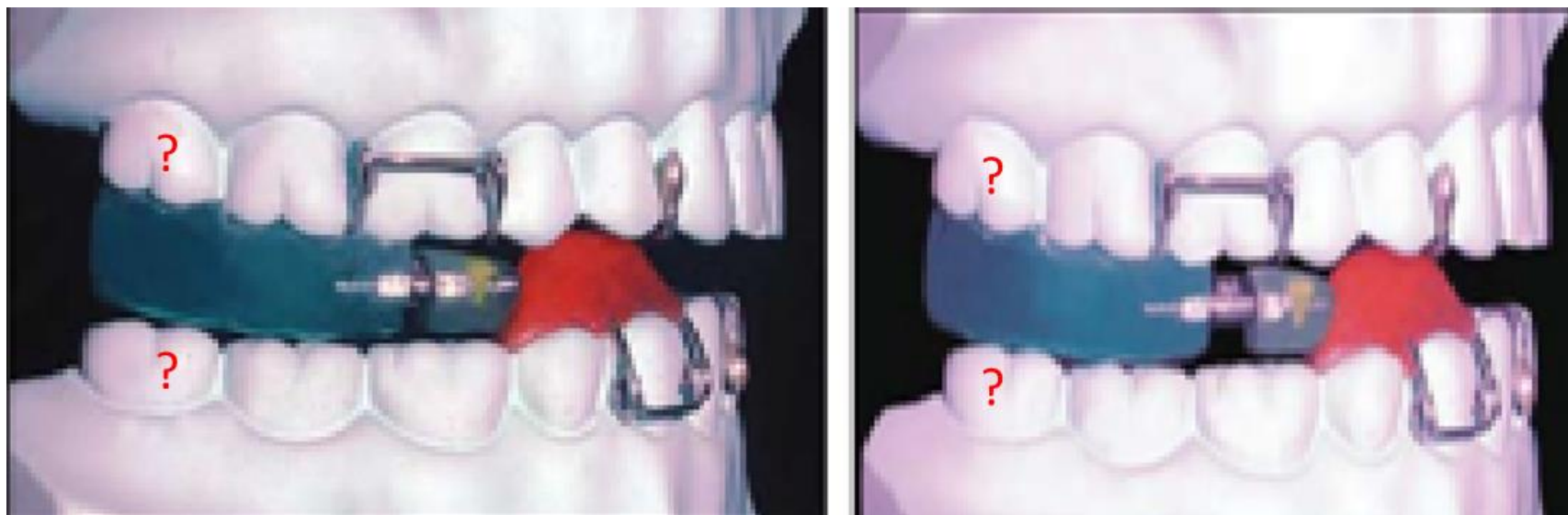
Reactivation of Twin Block

An additional activation is necessary if OJ is $>10\text{mm}$.

1- light cure acrylic on the anterior surface of inclined bite plane



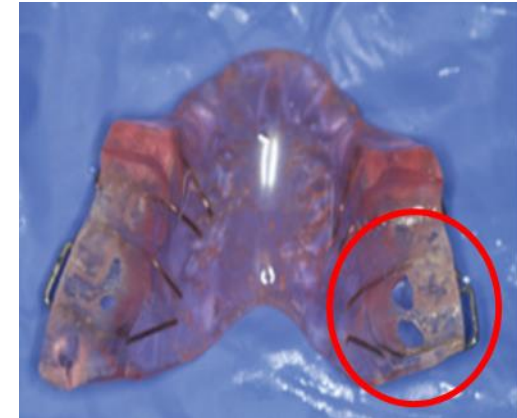
2- Incorporating a jackscrew to advance the upper inclined block



Signs of patient's compliance

4-6 weeks postinsertion visit, the following signs should be noticed otherwise the patient does not engage with the appliance:

- 1- Patient speech normally while the appliance in the mouth
- 2- signs of tear and wear on the appliance
- 3- patient spontaneously occludes in the new protruded position while the appliance outside
- 4- a small degree of lateral open bite should present due to the presence of the acrylic blocks and claspings of the first permanent molars.
- 5- patient can reinsert the appliance confidently



Retention

- Lab work on rats showed type **III collagen** resorbable after **7months** appliance wear.
- However, **O' Brien et al.** doubling the period showed signs of bone formation
- A Twin Block on a nighttime wear basis may be considered to preserve antero-posterior correction
- However, withdrawal of the postured bite at an earlier stage is subject to antero-posterior relapse..

Relapse

Clinical trials showed **after 1 year of full-time appliance wear** the overjet relapse is not more than **1 mm**.

Treatment Phases

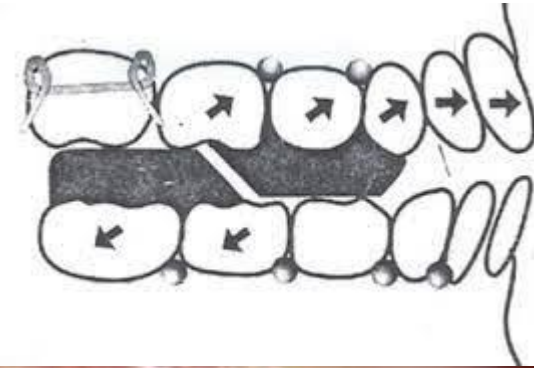
Active phase 1st-6th month

Support phase 6th -9th

Retentive phase 9th -12th /15th month

Modifications

1- Reverse Twin Block



Standard



Reversed

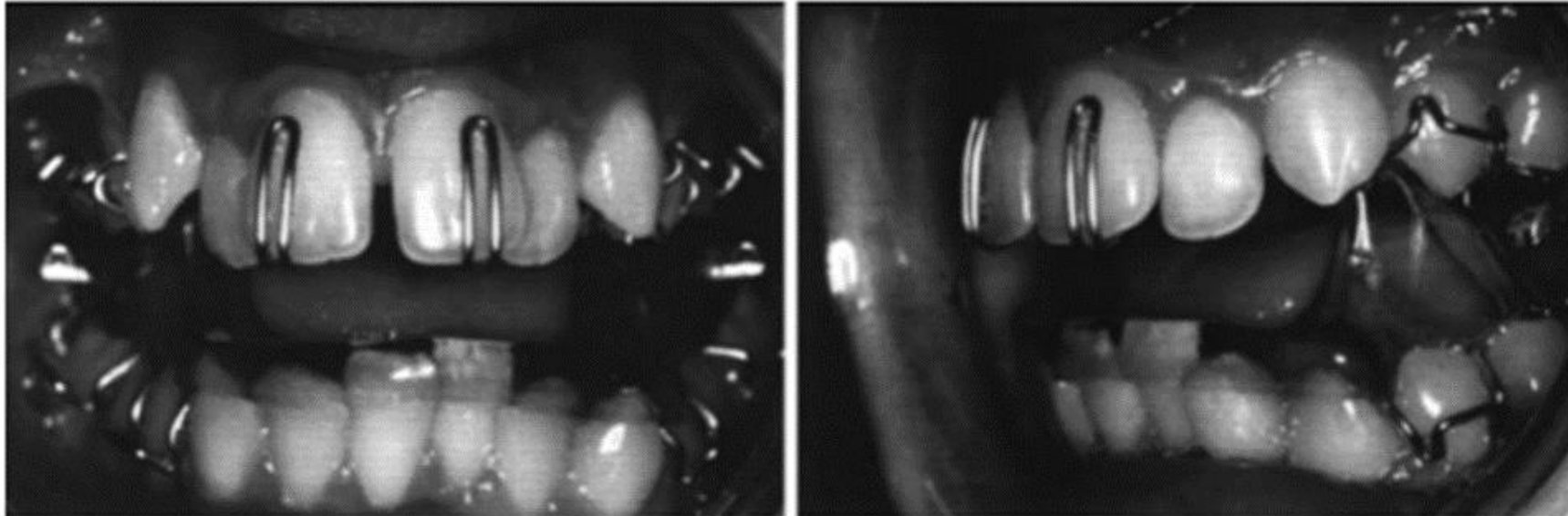
2. Twin block with lip pads to work like Frankel III

- rhomboidal in shape
- Class III malocclusion is easy to diagnose but challenging to treat.
- It was believed that adding rapid expansion, hyrax screw, could yield more skeletal changes

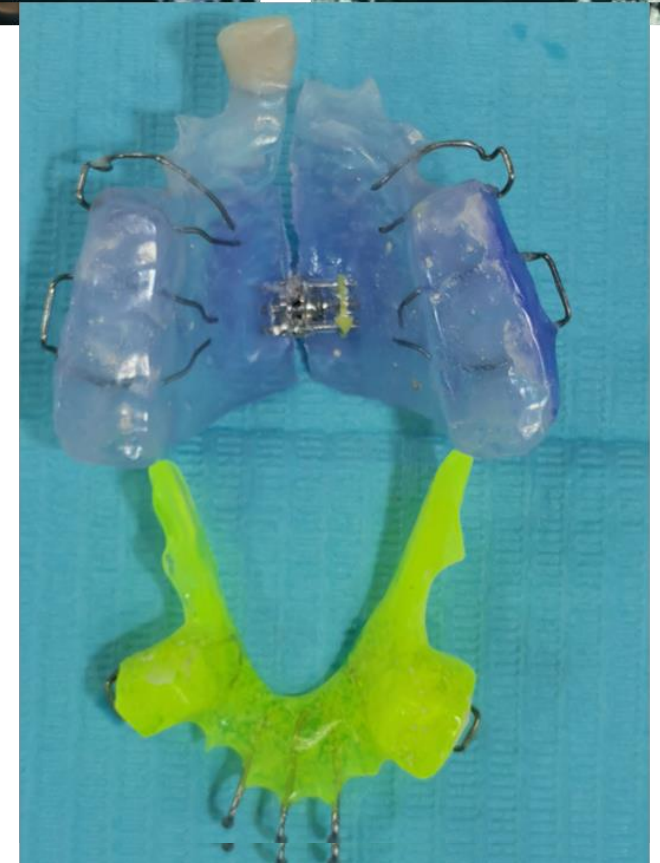
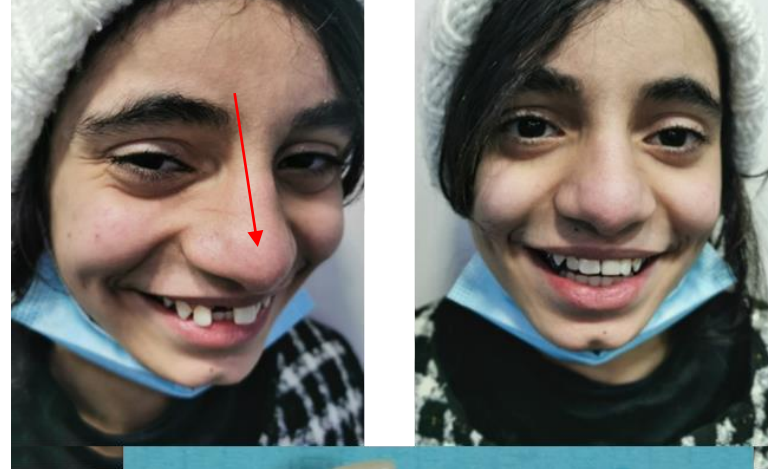


3- Twin Block to Control Incisor Inclination

The reduction in incisor proclination was statistically and clinically very significant as compared to appliances with labial bow

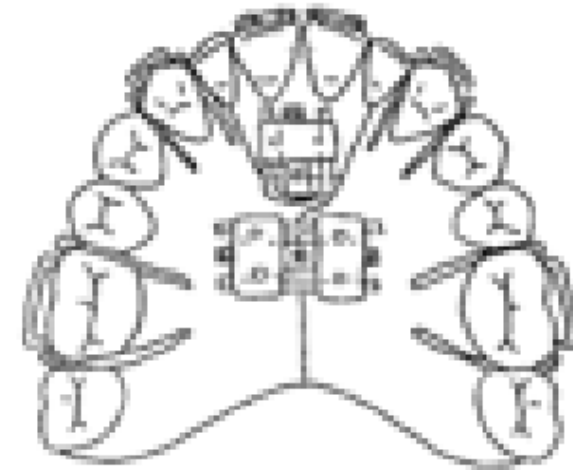
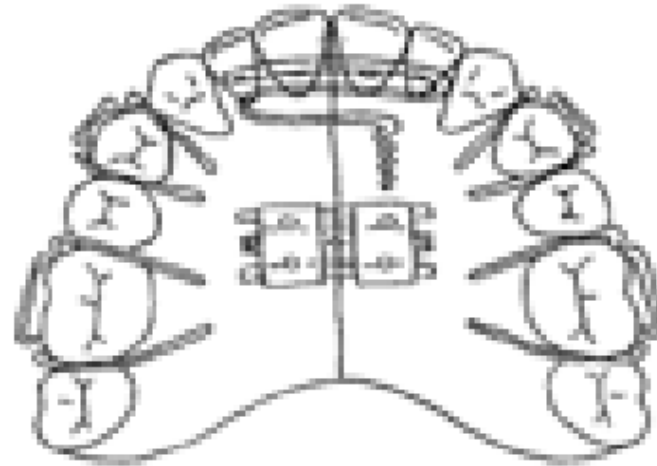


4- Adding teeth to improve esthetics



5- Modified Twin Block for class II div2

Screw
Z spring
T spring



DOI: 10.1093/ORTHO/28.4.271 • Corpus ID: 20307052

The modified twin block appliance in the treatment of Class II division 2 malocclusions.

F. Dyer, H. F. McKeown, P. J. Sandler • Published 1 December 2001 • Medicine • Journal of orthodontics

Two case reports illustrate the effective treatment of Class II division 2 malocclusion with modifications to the Twin Block appliance. This approach may reduce the total treatment time and reduce the need for extra-oral anchorage. In each of the cases presented treatment has been carried out on a non-extraction basis with full correction of the malocclusion.

[View on PubMed](#)

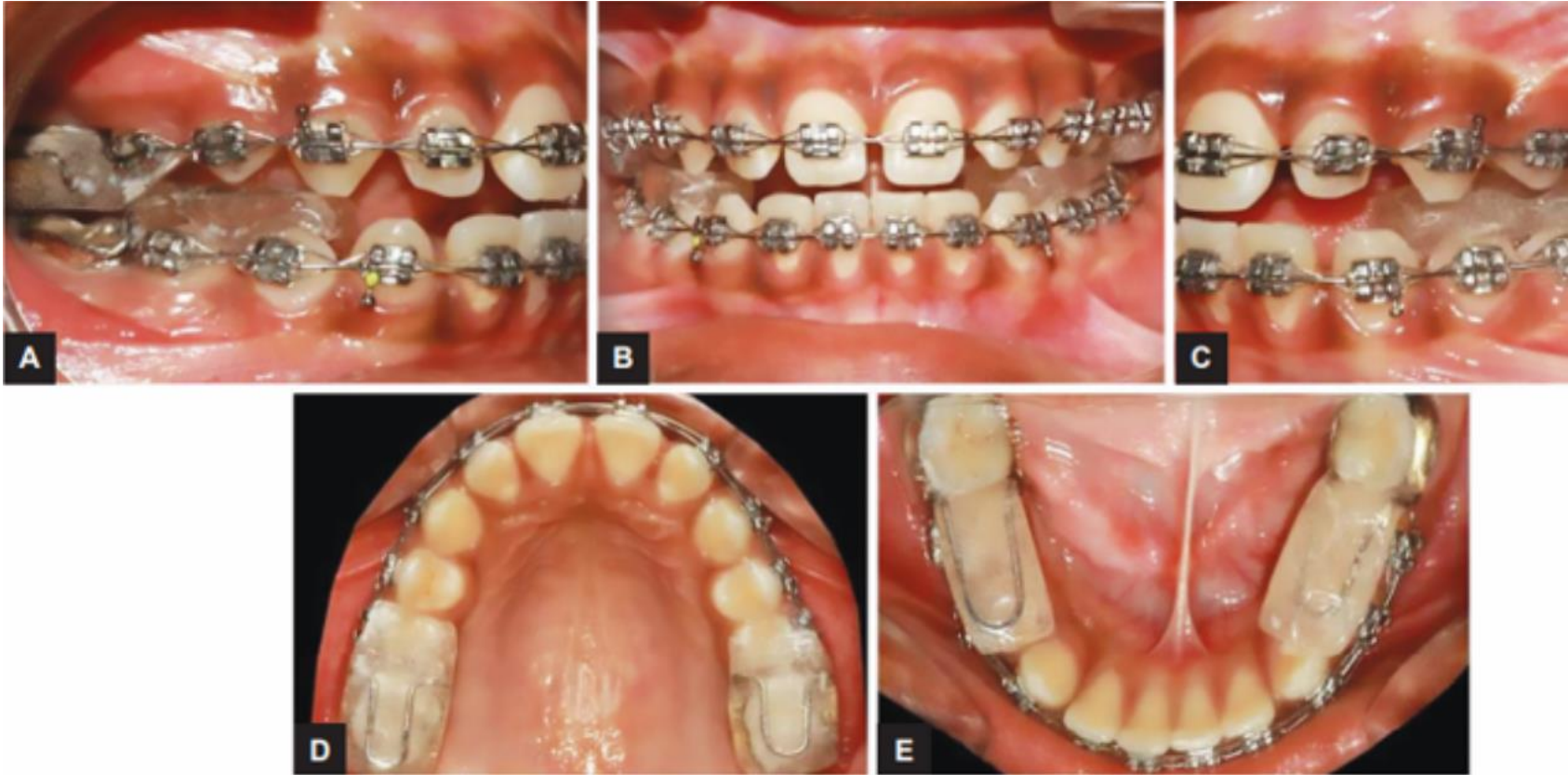
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6- Fixed Twin Block



7- Magnetic twin block

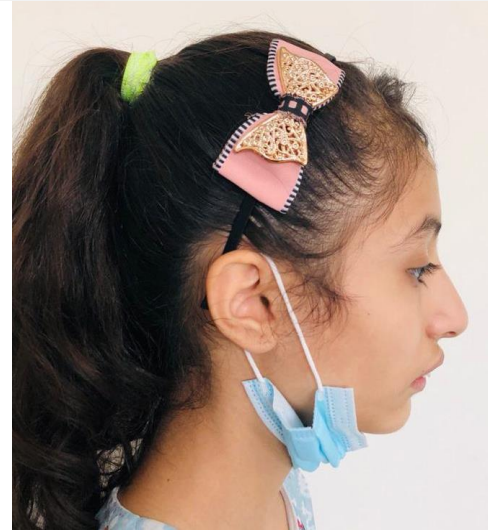
Magnets can encourage increased occlusal contact on the bite blocks to maximize the favorable functional forces



To conclude:

- 1- functional orthopedic therapy comprises one of main interceptive contemporary orthodontic means
- 2- mandibular condylar cartilage is primary growth center at infancy and juvenile age, but epigenetically controlled at pubertal age.
- 3- adaptive condylar/glenoid fossa growth may take place in response to functional therapy rather than a significant increase in mandibular body length
- 4- Twin Block appliance is the most popular functional therapy in the UK for its versatile properties
- 5- Colleagues at this department are invited to involve in clinical trials to evaluate the Twin Block efficiency on Iraqi patients

Twin block experience at this school





Twin block at this school

Acknowledgement

Samar

MSc students

- Hibba Jabar
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Thank you