GERBER BANDED BLOCK
A Retrospective Study

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Patient cooperation problems lead to the initial development of a banded version of the ever popular removable Clark Twin Block in 1995. Since that time numerous appliances have been constructed and used based on the original design by this author.

The birth of the Gerber Banded Block was due to the lack of success of the Herbst type appliances and many other fixed class II correctors. Most of which continue to be plagued by the same causes of failure regardless of design. Additional therapeutic drawbacks include a distalizing effect to the maxilla with many of these appliances and the failure for the patient to achieve a normal chewing cycle during appliance wear.

The Clark Twin Block has had a monumental impact on the functional orthodontic movement. The appliance has awakened the eyes of many who have doubted the validity of functional treatment. Variations of the “Block” have virtually replaced the Bionators, Activators and FR 2 Fränkel as the appliance of choice when advancing the mandible with removable functional appliances.

This author has advocated the use of a fixed Rickinator or Rickinator Plus as the follow-up appliance to the various ‘blocks’. These fixed maxillary bite planes permit a controlled support of the AP correction derived from the ‘blocks’ and as a support appliance in vertical correction.
The fixed-banded version of the Twin Block has over 19 successful years of use and many prominent orthodontic laboratories currently construct a form of the appliance. However, the most desirable orthopedic therapy has dictated appliance modifications. Many of these well-intended changes have led to the development of entirely new groups of appliances. Most of which fail in structure to hold-up to the everyday rigors or fail in design to achieve neuromuscular balance necessary for successful class II stability.

Banded Block Negative Factors are:
1. Hygiene
2. Band Failure
3. Insertion
4. Patient Tolerance

Banded Block Advantages:
1. Advances and Promotes Mandibular Development
2. Maintains Normal Chewing Cycle
3. Fixed & Durable
4. Short Term Use (usually 3-4 months)
5. Predictable Results
6. Enhances Maxillary Development

The concept is currently embraced by practitioners of orthodontics and by those treating temporomandibular disorders (TMD). The treating doctor must choose the appliance that best achieves treatment objectives, and one that is not destroyed or tossed away at McDonald's.

The positions of the maxilla and the mandible must be evaluated in order to determine the neuromuscular relationship to each other. The importance of this relationship is found in the long term stability and normal TMJ function. The patient must have a properly proportioned skeletal system that is in harmony with a balanced muscle function while maintaining normal occlusal relations. Thus, the total function of the craniofacial complex is ultimately related for optimum functional stability.
**REMOVABLES are sometimes lost...** Overcoming the obvious disadvantages of removable Functional Jaw Orthopedic (FJO) appliances has become a clinical necessity. Due to the success of the original Twin Block it was the appliance most likely to provide optimum mandibular repositioning and not at the sacrifice of maxillary development. The ability to achieve neuromuscular balance and stability is another factor that favors the appliance. Clinically it can be observed the normal chewing cycle is not only improved but also maintained to the highest standards of neuromuscular function with Fixed or Removable Twin Block treatment. The principles of balance and stability are best represented through proper function.

Mandibular function can and must be improved through the use of functional appliances. The Twin Block design meets the substantial requirements of skeletal corrective therapy. TMJ function is also enhanced through neuromuscular balance gained with mandibular re-positioning and adaptation of the masticatory musculature.

**There are flaws or weaknesses in the original Clark Twin Block appliances** that limited success. Being removable, the appliance has the obvious disadvantage of cooperation. To appraise success or failure we must first evaluate the available appliances. Upon initiation of removable Clark Twin Block therapy this practitioner realized an immediate increase in the cooperation level of the patients who would previously have been treated with Bionators. However, since this appliance was removable not all patients selected for therapy would fully cooperate. The cooperation level is defined as the percentage of patients that meet a set of pre-treatment goals and/or therapeutic objectives. Most importantly these treatment or therapy goals must include the stable and balanced position of the mandible. Additional skeletal and neuromuscular changes are desirable, and can be defined by the dental practitioner based on his/her clinical experience.

The second shortcoming of traditional Twin Block treatment was found in the reliance upon a removable bite plane to complete vertical development and retain the mandibular advancement. Another removable functional appliance, the Bionator was able to meet all finishing objectives in (55-60%) of the patients in a clinical study by this author. It can be determined that because the appliance was removable and not properly worn that the (40-45%) patients would be deemed as failures, since the mandible would not advance and be maintained in a stable position. Fortunately, with natural developmental growth an undetermined percentage of patients did not have to suffer through treatment failures and even met pre-treatment goals of treatment regardless of cooperation levels.

This phenomenon is best understood through the application of the Gonial growth angle used in the Advanced Archial Analysis and Sassouni Plus Cephalometric studies. Dr. Richard Beistle first incorporated the growth angle into Sassouni Plus. This evaluation is a formula that uses angular measurements to determine the direction of growth. Pre-treatment evaluation of this angle will give the practitioner a clue as to the horizontal and/or vertical growth potential of the patient.

It can be documented that many patients exhibit the normal downward and forward mandibular growth direction as described by Enlow. This analysis can be used to evaluate patients for growth potential.

**GONIAL ANGLE = DIRECTION OF GROWTH**

In order to determine the angular relationship in which the Ramus and the Mandibular Body are put together, the Gonial Angle needs to be divided into two parts. The Upper
Angle (UA) represents the horizontal growth factor while the Lower Angle (LA) is indicative of the vertical growth component of the mandible. It must be noted that the eruption or lack of eruption of the posterior dentition can be a causative factor or a consequence of the Angle of Growth (AOG).

**Horizontal Component of Growth**
Large Upper Angle is greater than 55° = Growth is Forward.
Small Upper Angle is less than 52° = Growth is Down and Backward - Clockwise.

**Vertical Component of Growth**
Large Lower Angle is greater than 75° = Growth is Downward.
Small Lower Angle is less than 70° = Growth is Forward - Counterclockwise.

A simple solution to determine growth direction is by dividing the upper angle by the lower angle. The resulting % indicates a potential growth direction.

![Gonial Angle of the Mandible](image)

- 60< = very Clockwise (open)
- 60.1-68 = Clockwise
- 68.1-69.9 = Clockwise tendency
- 70-78 = Neutral Growth
- 78.1-79.9 = Counter Clockwise tendency
- 80-87.9 = Counter Clockwise (deep bite or closed)
- 88> = very Clockwise

Banded Block on Laboratory Model (Maxillary Section)
DESIGN AND CONSTRUCTION
The Banded Block (Twin Block) was first developed in 1995 by this author with technical assistance from Mr. Tom Magill of Universal Dynamics Laboratory in Minneapolis, MN. The emphasis on the appliance design was to preserve the original treatment concepts set forth by Dr. William Clark, of Fife, Scotland.

The initial clinical problems encountered with the Banded Block centered on the durability or ability of the appliance to withstand the demands placed on an appliance that would be cemented into the oral cavity for up to nine months. It was later found that a treatment wear time of four to six months was more common. In an effort to establish a design for the Banded Block we first studied the Herbst Appliance, a close cousin of the new appliance. Because of the similarities in construction and the author's previous experience as a laboratory technician and through clinical use of the Herbst and similar appliances, it was decided to evaluate the weaknesses of Herbst construction, durability and usage. Another problem we encountered was oral hygiene. A cemented appliance always presents numerous difficulties to the patient.

The understructure of the appliance is made of stainless steel wire and incorporates orthodontic bands in the superstructure to perform similar functions as what would be found in the major connector in removable partial dentures. The resulting superstructure would provide support for the mandibular or maxillary acrylic blocks.

The acrylic blocks are similar to that found in the original Clark appliances. The difference is that the corners or lateral edges of the acrylic are slightly rounded so as to conform to the neuromuscular function as advocated by Jankelson. This is important, as the appliance will be expected to perform at a sophisticated level of treatment. Quite simply put, a more normal functional relationship is attained and developed through the proper vertical and anterior-posterior relations. The more rapidly neuromuscular balance is achieved, the less likely that the appliance will become damaged by muscle hyperactivity (dysfunction). The concept of chewing with the appliance is usually ignored by other fixed FJO appliance designs.

This necessary configuration of metal is designed to hold the acrylic 'blocks' in place. The current design should not be compromised for it consists of over four-years of development and its clinical application is essential to the longevity necessary for the Banded Block’s success. The acrylic should not be allowed to completely 'seal' the occlusion. A close adaptation will allow the patient to use oral hygiene methods that will be suitable for irrigation under the blocks, and still preserve stability. Also, the blocks will maintain their necessary functional stability.

OBJECTIVES... SUCCESS RATE...

The obvious treatment goals of mandibular advancement and neuromuscular balance can and will be obtained with use of the Banded Block. It has been evident to this clinician for many years that fixed orthodontic/orthopedic appliances perform at a more desirable therapeutic level. Many well-intended removable appliances just do not succeed in today's practices. Don't be deceived, not all of your patients will wear removable functional appliances, as you no doubt have discovered.

ADVANTAGES...
The placement of orthodontic bands that are necessary to retain the appliance are readily accepted as 'braces with a fixed retainer'. The appliance that is in the mouth – is in the mouth. Yes, twenty-four hour wear is the most desirable of all
advantages for Functional Jaw Orthopedic repositioning appliances. Neuromuscular balance is attained only through the continuous use of FJO appliances.

Most parents seem to like the idea of not looking for lost appliances, or constantly ‘nagging’ their child to keep the appliance in the mouth. Furthermore, when shown the actual appliances, they overwhelmingly have selected fixed functionals over the removable Twin Blocks.

Not surprisingly, due to constant wearing of the block it is overwhelmingly reported that a shorter treatment time is required to accomplish clinical objectives. Improved compliance results in a reduced length of treatment. With constant wearing of the Banded Twin Block appliance one advantage is quite clear, all chewing is done with the appliance in place. This greatly hastens the neuromuscular changes necessary for successful mandibular repositioning therapy.

**RICKINATOR PLUS...** Another big plus in the use of the Banded Block can be found in the use of the fixed Rickinotor to stabilize the new position of the mandible. The appliance is constructed with the Banded Block by the laboratory and sent with that appliance to the doctor. Typically after four to six months of treatment the upper and lower Banded Blocks are removed and the Rickinator Plus appliance is immediately inserted using lingual Wilson 3-D attachments.

The appliance can be constructed with or without a midline screw depending on the treatment plan. One small disadvantage of the Banded Twin Block is its inability to have expansion components built into the device. It is for this reason that the transverse and sagittal dimensions be corrected prior to Banded Twin Block therapy. The fact that we can now incorporate the transverse expansion screw into the Rickinotor (Rickinator Plus) appliance allows us to fine-tune any expansion while completing the vertical and maintaining the AP.

Case selection can easily be determined by the potential lack of cooperation with a removable Twin Block appliance. The typical patient considered for banded block treatment would normally be a skeletal class II malocclusion. More commonly referred to as retronathic mandible.

**Appliance Review for Appliance Selection**

1. Confirm skeletal Class II diagnosis.
2. Before inserting the Banded Block it will be necessary to first develop the upper dental arch to the correct sagittal and transverse dimensions.
3. Separate the teeth to be banded for at least 24-48 hours prior to taking the dental impressions.
4. Take impressions, pour and wrap separately along with the construction bite when sending to the laboratory. The stone models should be chair-side when taking the construction bite. This step is to insure the fit of the wax bite onto the models in a stable relation. The construction bite is taken in the usual manner as with a standard removable Twin Block for correction of the skeletal malocclusion.
5. Don’t forget to send a detailed prescription for the blocks and for the fixed Rickinator Plus.
6. The phase II Rickinator Plus will need to be constructed at the same time as the blocks.
7. Inspect the appliances when received from the laboratory. If the appliances are correct the patient should be scheduled for separation that will need to be in place.
24-48 hours before insertion. The phase II Rickinator Plus will come from the laboratory unless you instruct them differently.

8. The Rickinator is used to maintain anterior advancement and assist in the eruption and elevation of the posterior teeth. It will be inserted immediately upon removal of the Banded Block.

9. Insert the Banded Block and instruct the patient on the usual home care instructions. Remember the patient will have difficulty in eating and talking for the first few days. Remind them that this is only temporary and will only be an inconvenience for a couple of days.

10. In approximately four months for neutral and counter-clockwise growers, and in no sooner than six months for clockwise growers you will need to remove the appliance. Again treatment time varies with the direction of growth.

11. The successful use of any Twin Block type of functional appliance is greatly enhanced by the amount of chewing while wearing the appliance. Normal neuromuscular function will be attained only with the use of proper functional jaw orthopedic devices that are constructed to the proper jaw relations.

12. Insert the Rickinator Plus immediately upon removal of the blocks. If your appliance has a midline screw it will need to be activated at least on a weekly basis. The patient will need to wear this appliance with orthodontic brackets for another four to six months.

13. Orthodontic brackets are placed on the upper and lower dentition when the Rickinator is inserted. However, you will also need to place separators for the lower bands, which will assist the molars in vertical eruption. Later you will use NiTi type reverse (Nitaiium RCS SL archwires) curved archwires to eliminate or reduce the need for vertical elastics.

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5. Jankelson, RR. Neuromuscular Dental Diagnosis and Treatment, St. Louis: EuroAmerica, 1990.
7. Gerber and Beistle, Orthodontic Course Manual, 2nd Ed. 1987