The activator and its modification - A review

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Abstract
Introduction: Functional appliance are different varieties of appliances fabricated mainly to correct skeletal class II by enhancing mandibular growth. Functional appliances are mainly intraoral to which extraoral forces can be attached (headgear).There are number of functional appliances used such as activator, bionator, twin block appliance, Frankel's regulators etc.
The activator, designed by Andresen and Haupl, was fabricated to advance the mandible by several millimetres for correction of class II malocclusion. The appliance was loosely fitted so that the patient could hold the appliance in position actively (by muscle activity or by functioning). The activator was modified by many practitioners to be used in different situation, depending on the cases.
This review will emphasize on the activator and its derivatives as it was the first functional appliance to be widely accepted.
Conclusion: The activator could be considered as an alternative within a modern orthodontic practice for correction of skeletal malocclusion in growing childrens. The success of the appliance totally depends on the patient compliance, orthodontist should consider this before planning for an activator (conventional activator- due to its Bulkiness), modified activators can be a better option in such situations.

Keywords: Functional appliance, Activator, Modified activators, Skeletal malocclusion.

Introduction
"It is well recognized biological fact that structural form is influenced by pressure due to abnormal neuromuscular activity; the converse being true that normal pressures, due to function, tend towards normal form in the osseous structure (Alfred Paul Rogers)" Was one of the reason for the development of functional appliances.

"Functional appliance" are removable appliances which affects the arrangement of orofacial musculature that transmit forces to the dentition and the basal bone. Functional appliance acts by either harnessing the muscles forces or by preventing aberrant muscular forces. Functional appliance by altering the mandibular position (forward and downward) brings about orthodontic and orthopaedic changes.[1]

Functional appliance are different varieties of appliances fabricated mainly to correct skeletal class II by enhancing mandibular growth. Functional appliances are mainly intraoral to which extraoral forces can be attached(headgear).

There are number of functional appliances used such as activator, bionator, twin block appliance, Frankel's regulators etc but this review will emphasize on the activator and its derivatives as it was the first functional appliance to be widely accepted.

The Activator
Andresen stated that orofacial musculature has a major role in teeth positioning, using this forces, one can move the teeth by creating a new reflex in the orofacial musculature.

The activator, designed by Andresen and Haupl, was fabricated to advance the mandible by several millimetres for correction of class II malocclusion. The appliance was loosely fitted so that the patient could hold the appliance in position actively (by muscle activity or by functioning).

It looked similar, to the monobloc constructed by Pierre Robin. The original activator by Andresen was tooth borne passive appliance, consisting of large acrylic splint covering palate and teeth in both the arches. The acrylic guides the eruption of mandibular teeth mesially whereas maxillary teeth are directed distally.[2]

Frankel and many other authors modified the functional appliance systems after Andresen described his system. But it can be true to say that the Andresen appliance i.e. the activator remains one of the most widely used of the functional appliances in various countries.

The activator was modified by many practitioners to be used in different situation, depending on the cases.

Modifications of Activator
Bimler appliance (Bite former, Bimler stimulator) (1949)
This appliance was designed by H.P. Bimler. There are three kinds of Bimler appliance:[3]

1. Type A – For treating Class II Division-1 Malocclusion
2. Type B -Class II Division-2 Malocclusion
3. Type C - Class III Malocclusion.

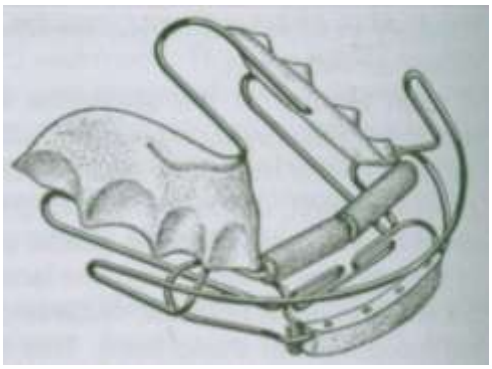

Fig. 1: Bimler appliance

Bionator (1950)
Bionator also known as 'skeletonized activator' is an activator-derived appliance developed by Professor Wilhelm Balter. When compared with the conventional activator, bionator is less bulky and elastic. Bionator modulates the muscle activity which enhances normal development.it comprises of buccinator loop which prevents cheek pressure from acting on buccal segments. Palatal arch stabilizes the appliance.[4,5]

Fig. 2: Bionator

The kinetor (1951)
It was designed by Dr. Hugo Stockfish in 1951. It is a type of elastic activator. It was combination of functional principles with active operation of various screws and springs added to the appliance. It has the capacity to expand in all three directions. This appliance had latex tubing between the upper and lower parts to stimulate function.[2,6]

Fig. 3: The kinetor

Herren Shaye activator (1953)
According to Herren mandible with activator during sleep will not maintain its position. The incisors will detach from the maxillary part when the mandible is lowered, this will lessen the effectiveness of the appliance. To maintain correct mandibular posture during sleep the following modification were done:

1. The mandible is advanced forward 3-4 mm beyond the neutral relationship by compensating the sagittal positioning in construction bite.
2. Jackson clasp, Duyzing clasp or Triangular arrowhead clasp are used for retention of the appliance on maxillary dentition.
3. To hold the appliance in position during sleep long lingual flanges were constructed
4. The posterior teeth were allowed to erupt occlusally whereas eruption of lower incisors was impeded by acrylic plane thus levelling the curve of spee.[5,7]

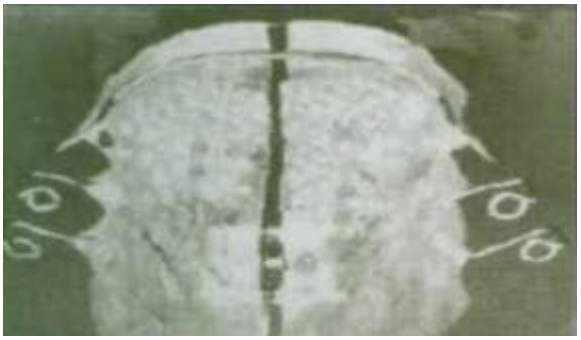

Fig. 4: Herren Shaye activator

Louisiana State University (LSU) or Activator of Shaye (1953)
It is a modification of Herren activator by R Shaye. LSU activators causes sagittal repositioning of the mandible to a significant degree and have the following effects:

1. Increase in the forward positioning of the mandible causes stretch in the retractor muscles whereas the protractor muscles (lateral pterygoid) are slackened. This new positioning of lower jaw leads to a new sensory engram.
2. According to Herren wearing of this appliance would not increase lateral pterygoid muscle (LPM) activity. This appliance works on phantom activator phenomenon.[5]

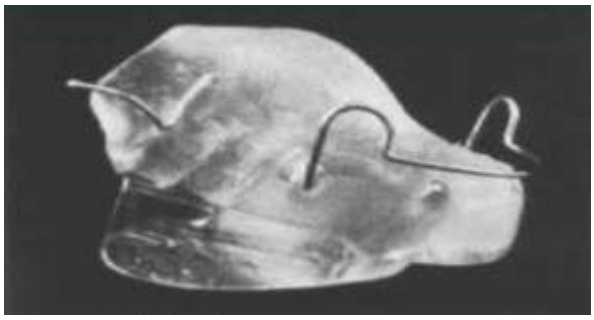

Fig. 5: LSU Activator

Bow activator of AM Schwarz (1956)
The bow activator consist of maxillary and mandibular portion connected by an elastic bow. It is a horizontally split activator which allows stepwise sagittal advancement of the mandible by adjusting the bow. It can be used in subdivision cases by activating only the bow on the side of unilateral disto-occlusion. Expansion can be attempted by activating the screws.[2,5]

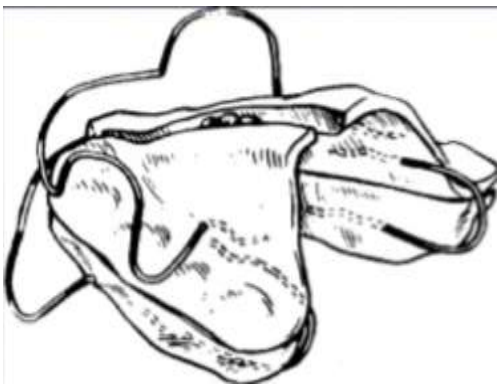

Fig. 6: Bow Activator

Elastic open activator (1960)
This appliance was designed by G. Klammt. Acrylic bulk is reduced and is replaced by wire. Wire components increases the flexibility of the appliance. Reduction in the acrylic components increases wear time. Isotonic muscle contractions are allowed due the flexible design.[4,5]

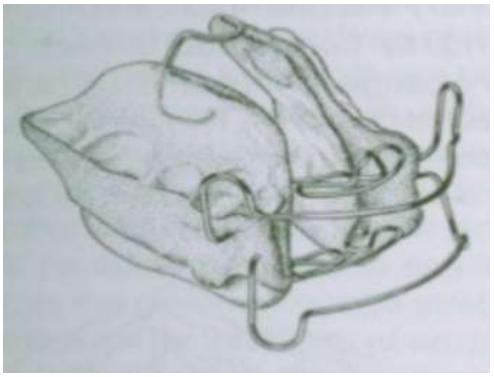

Fig. 7: Elastic open activator

Karwetzky modification (1964):
This appliance is similar to bow activator. It consists of upper and lower active plates joined in the first molar region by 'U' bow. U bow has one short leg and one long leg, depending on which arch to be moved both the legs are embedded accordingly. By constricting the U bow horizontal movements are created.[5,8]

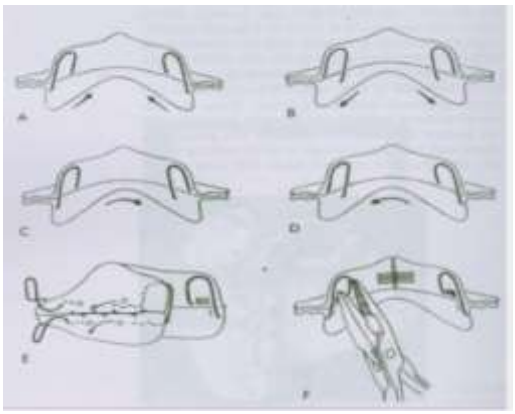

Fig. 8: Karwetzky modification

Propulsor (1968)
This modification had no wire connecting the upper and lower parts. Acrylic connected the upper and lower parts with acrylic flanges. This type of activator was designed by Muhlemann and refined by Hotz. This appliance is also known as the hybrid appliance because of features of vestibular screen and monobloc. Commonly used in maxillary dento-alveolar protrusion.[9]

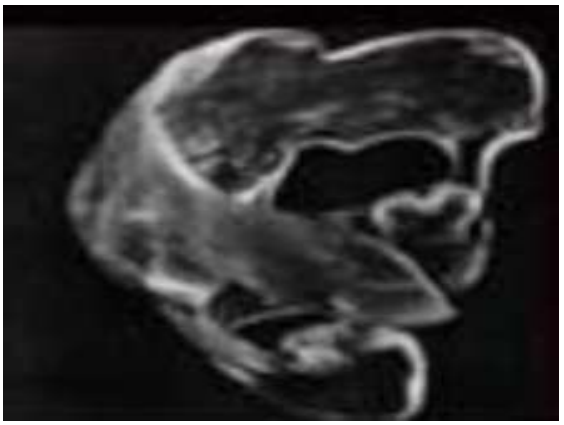

Fig. 9: Propulsor

Harvold/ Woodside Activator (1971)
This activator formed by construction bite which allowed the bite to open around 10-15 mm beyond the postural rest position of the mandible. Muscular adaptation and changes were seen due to the viscoelastic properties of soft muscles and elasticity of soft tissues. Their sagittal opening was around 3-5 mm distal to maximum protrusion of one's jaw.[4,10]

Fig. 10: Harvold/ Woodside Activator

Wunderer modification for Class III malocclusion (1971)
It is horizontally splitted appliance with upper and lower parts connected by a screw which is embedded in mandibular portion. When the screw is opened it causes maxillary portion to move forward and reciprocal posterior movement in the mandibular portion.[5]

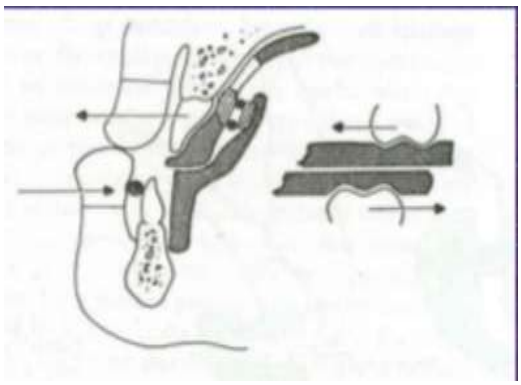

Fig. 11: Wunderer Modification

Reduced Activator or Cybernator of Schmuth (1973)
Cybernator similar to bionator has reduced acrylic part in maxillary anterior area leaving a small flange of acrylic on palatal slope. The two parts are connected by omega shaped palatal wire. The lower acrylic part is splitted to permit expansion. The appliance is made more resistant by a lower labial bow.[5]

Fig. 12: Cybernator

Cut out or Palate-free Activator (1974)
This modification is given by Metzelder which combines advantages of bionator and activator. The maxillary portion has acrylic on the palatal aspect of buccal teeth and small part of adjoining gingiva while the palate is free. In the narrow anterior portion of appliance a small screw is incorporated. Protrusion springs can be added in class II div 2 cases for lingually tipped upper incisors. The mandibular portion is same as regular activator. Due to increase wear time success should be greater with the palate free activator.[5]

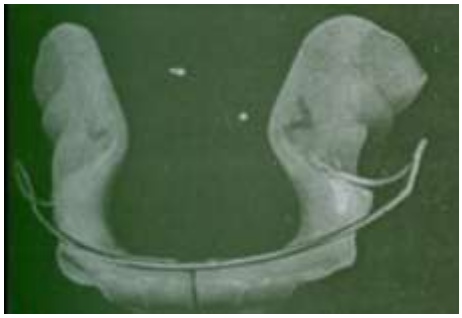

Fig. 13: Palate free activator

Teuscher-Stockli activator/ headgear combination appliance (1978)
It is a modified activator in combination with a high pull headgear. It was designed to avoid the detrimental profile effects of cervical tractions during the treatment of class II malocclusion in growing individual. At the level of maxillary second premolar or first molar buccal headgear tubes are incorporated in the inter-occlusal acrylic.[5,11]

Fig. 14: Teuscher-Stockli activator

Van Beek Activator (1982)
Headgear-activator combination appliance. Between incisors a short and strong outer bow is embedded in acrylic of the activator. Both upper and lower incisors are covered by acrylic. Mandibular position is achieved by lingual flange. [5,12]

Fig. 15: Van Beek Activator

Nocturnal airway patency appliance (1987)
Designed by Peter T George. NAPA was fabricated to keep the airway patent during sleep by posturing the tongue more anteriorly by mandibular protrusion.[13]

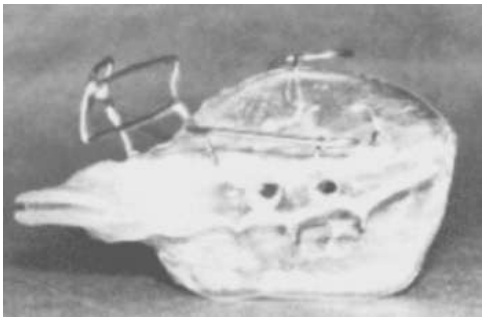

Fig. 16: Nocturnal airway patency appliance

Lehman activator:(1988)
It is a combination activator-headgear appliance. The design comprises of a maxillary acrylic plate to which rigid outer bows are attached and a mandibular lingual shield. It also comprises of two expansion screws (one anterior and one posterior) by which selective expansion is possible.

A head strap is attached to the outer bows through which occipital traction is applied. Maxillary plate and mandibular shield I connected by means of two heavy S-shaped wires. In this appliance bite registration is taken in centric occlusion.[14]

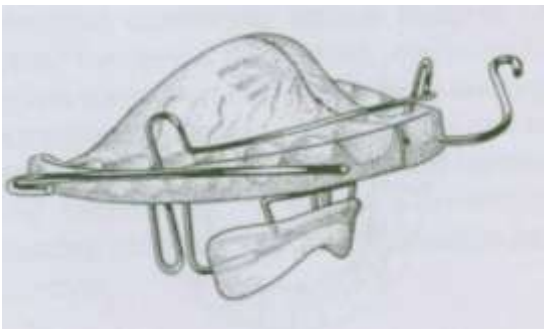

Fig. 17: Lehman activator

Magnetic Activator Device (1993)[5,15]
Developed by Dellinger, magnetically active appliance.
Magnetic activator device are as follows:

1. MAD I: Correction of lateral mandibular displacement.
2. MAD II: Correction of Class II Malocclusion.
3. MAD III: Correction of Class III Malocclusion.
4. MAD IV: Correction of Open Bite.

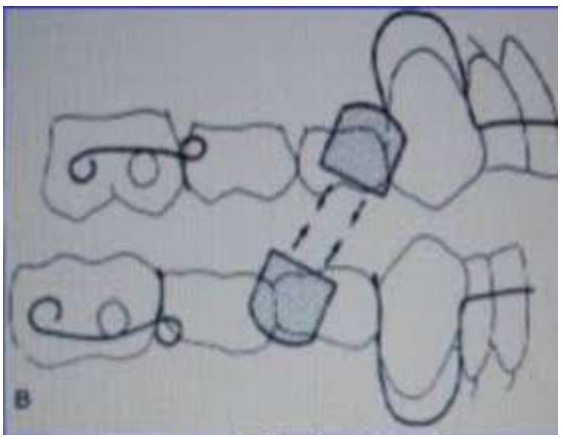

Fig. 18: Magnetic Activator Device

Elastic activator for treatment of open bite: (1999)
In this type of modification the intermaxillary rigid acrylic is replaced by elastic rubber tubes. The elastic activator intrudes upper and lower posterior teeth, by stimulating orthopaedic gymnastics (chewing gum effect). It can be also used for eliminating habits by incorporation of cribs.[5,16]

Fig. 19: Elastic activator for treatment of open bite

Ortho T Activators
This appliance was constructed by elastomeric material. These are preformed activators, used in the treatment from early through late mixed dentition. These appliances coined as EGAs (Eruptive Guidance Appliance) also function as a positioner and in correction of overbite and mild to moderate crowding.[17]

Fig. 20: Ortho T Activators

Modified Teucher Activator (2006)
It is modification of Teuscher activator designed mainly to control upper incisor inclination. Headgear tube is present in the premolar region for the use of high pull headgear.[18]

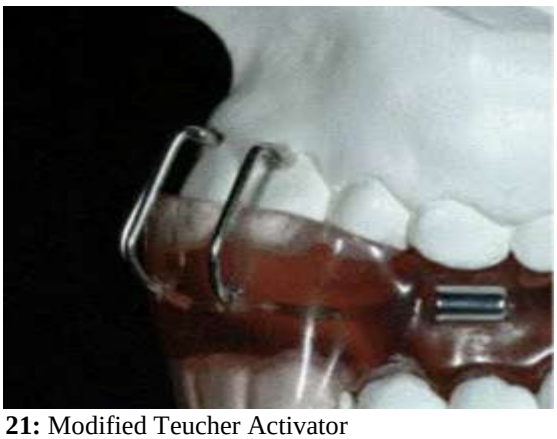

Fig. 21: Modified Teucher Activator

Conclusion

1. Problem, diagnosis, treatment objectives, and treatment plan always dictate which appliance to be used in which situations.
2. The activator could be considered as an alternative within a modern orthodontic practice for correction of skeletal malocclusion in growing children.
3. The success of the appliance totally depends on the patient compliance, orthodontist should consider this before planning for an activator
4. (Conventional activator- due to its Bulkiness), modified activators can be a better option in such situations.

Conflict of Interest: None.

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