CASE REPORT

Active Vertical Corrector- A Case Report

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ABSTRACT: Correct force application is the prescription of orthodontic tooth movement. Other than the conventional force systems, a new force system has been introduced in orthodontics called the magnetic force system. The difficulties which arise during treatment of anterior open bites, have challenged many orthodontists due to delayed treatment time and relapse caused by tongue pressure etc. The anterior open bite is corrected by extrusion of the anteriors, which is often unsatisfactory due to poor aesthetic result. Hence, intrusion of the posteriors resulting in autorotation of the mandible anteriorly is preferred. A pediatric patient treated with AVC is presented in this article.

Key words: *Skeletal open bite, bite block therapy, active vertical corrector using magnets.*

Skeletal open bites are caused mainly by over eruption of the upper posterior teeth or vertical over growth of the posterior dentoalveolar complex. These could be due to posterior rotation of the mandible, superior repositioning of the glenoid fossa due to under development of the anterior portion of the maxilla or a combination of these effects.

Surgical intervention such as Lefort I procedure is the treatment of choice for a severe skeletal open bite. Orthodontically, early correction can be achieved through high pull headgears, activator, combined headgear and upper plate, open bite bionator and activator headgear combinations.[1,2]

There are two treatment approaches available :

1. Orthodontically, early correction can be achieved through high pull headgears, activator, combined headgear and upper plate, open bite bionator, activator headgear combinations, active and passive bite blocks and vertical chin cups. High pull headgear is a popular approach to the correction of anterior open bite inhibiting vertical maxillary development and allow for a forward rotation of the mandible, thus closing the bite.

2. An alternative approach to open bite correction is posterior bite blocks to achieve inhibition of maxillary posterior dentoalveolar development and autorotation. This is achieved by preventing the maxillary and mandibular posterior teeth from erupting and by opening the bite several millimeters so as to stretch the posterior muscles of mastication causing them to act as intrusive agents on the maxilla.

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The Active Vertical Corrector (AVC) is an adaptation of the present day bite block therapy introduced in 1986 by Dr. Eugene L.Dellinger.[3] The active vertical corrector is a patented appliance of Allessee Orthodontic Appliances (AOA) a subsidiary of ORMCO. In this article, a case report is presented treated with AVC.

DESIGN OF THE APPLIANCE

It works as an energized bite block consisting of two posterior occlusal splints, one for the upper and one for the lower jaw. Samarium cobalt magnets are incorporated into the acrylic splints over the occlusal region of the teeth to be intruded. One magnet per distal quadrant is used. The magnets in the upper splints are incorporated in a mode to repel the magnets in the lower splints therefore the appliance is a combination of acrylic posterior bite blocks and repelling magnetic forces.

The magnets used are cylindrical in shape with a diameter of 10 mm. The magnets along with the bite blocks measured 12 mm in height. Because samarium cobalt is a highly reactive, rare earth material, they are best isolated from the oral environment. Hence, they are hermetically sealed in stainless steel capsules. The magnets are also parylene coated to prevent leaching out

of cytotoxic materials. The magnets generate a force of 700 gm per unit at zero air gap in repulsion.

ADVANTAGES

1. Constant force system of AVC results in rapid tooth movement
2. Dental open bites give less stable results.
3. In slight skeletal open bite, the results are stable.
4. It has limited use in excessive open bite where orthognathic surgery is recommended.
5. The results are good if open bite is due to finger sucking.
6. The prognosis is bad, if open bite is due to airway obstruction or long face syndrome.

To prevent unwanted cross bite development due to the shearing forces of repelling magnets, angled buccal flanges are added to the lower occlusal splint to stabilize the appliance during lateral jaw movements. A heavy gauge stainless steel wire connects the occlusal splint of each arch.

CASE SELECTION

Presence of anterior open bite is the main criteria. The anterior open bite which is of skeletal origin rather than dental origin is preferred. The patient with dental open bite can also be considered.

Age

Both children and adults can be treated with AVC. In growing subjects, skeletal changes can be expected whereas in adults, more of dental changes will occur. Hence, growing patients in the mixed dentition period are preferred so as to elicit maximal response.

Wearing time for AVC

The patient should be encouraged to wear the AVC throughout the day. The more they wear, the faster it will work. The patient should wear atleast 12 hours per day. It is mandatory that it should be worn at night during sleep. It can be either cemented or bonded in place. At the end of 12 weeks, the appliance can be removed and the AVC can be worn as a removable appliance.

Appliance construction bite

Bite registering is one of the most important clinical elements in successful AVC use. Bite registering should

(Fig-1) Pretreatment extra oral photograph right and front view

(Fig-2) Pretreatment intra oral photographs

Fig 3: AVC appliance in position

be done by placing the patient in the most retruded centric relation position as a starting point. From that point, the mandible should be allowed to relax anteriorly and then come forward 2 to 3 mm. The construction bite is taken by placing the ball of wax between the incisal edges of the maxillary and mandibular teeth and the patient is instructed to bite on the wax until the appropriate vertical height is established giving 5 mm space in the posterior region to accommodate magnets, casings and acrylic splints (4 mm plus 1 mm safety factor equals 5 mm). As the mandible is opened or closed, care is taken not to shift midline.

CASE REPORT

A 12 years old female patient in mixed dentition period having moderate skeletal anterior open bite was selected for AVC appliance as a cemented appliance for three months. After three months, a removable appliance was given for 6 weeks. She was instructed to wear atlease 12 hours per day. She was comfortable with AVC except in the initial stage (Fig-1-4).

The pre and post treatment cephalometric findings are tabulated (Table -1-4).

OBSERVATION

On removal of the cemented appliance, the over bite correction of 4.5 mm was achieved. There was excess closure causing anteriors to occlude creating a posterior open bite of 1.5 mm. Proper functioning of the anterior teeth and acceptable aesthetics were achieved (Fig-5,6).

There was reduction in the gonial angle by 1 degree the mandibular plane angle by 2 degree. These findings clearly indicated autorotation of the mandible causing 3 mm increase in the mandibular length (Ar-B). The ANB angle also was reduced by 3 degree (Fig-7,8).

The upper molars were intruded by 3 mm whereas the lower molars did not intrude at all but remained in the same position. The upper incisors did not extrude whereas the lower incisors extruded by 1.5 mm and tipped lingually by 8 degree. The overjet was reduced by 2 mm since the mandible underwent autorotaion and came forward.

This combination of posterior intrusion, incisor extrusion and autorotation of the mandible caused the maxillary occlusal plane to increase by 5 degree and the mandibular occlusal plane to decrease by 9 degree.

Table 1 : Antero - posterior measurements

Angular / linear measurement	pre treatment degree / mm	post treatment degree / mm
SNA	84	86
SNB	75	80
ANB	9	6
Ar- B	85	88

Table 2 : Rotational measurements

Angular measurement	pre treatment degree	post treatment degree
MPA	34	32
SN-MP	40	38
SN - Max OP	15	20
SN - Man OP	19	10
Lower gonial angle	79	78

Table 3 : Incisor measurements

Angular / linear measurement	pre treatment degree / mm	post treatment degree / mm
U 1 - PP	26.5	26.5
L 1 - MP	108	100
L 1 - MP	37	42
Overjet	9	7
Overbite	-2	2.5

Table 4 : Molar measurements

Linear measurement	Pre treatment	post treatment
U 6 - PP	25 mm	22 mm
L 6 - MP	26 mm	26 mm

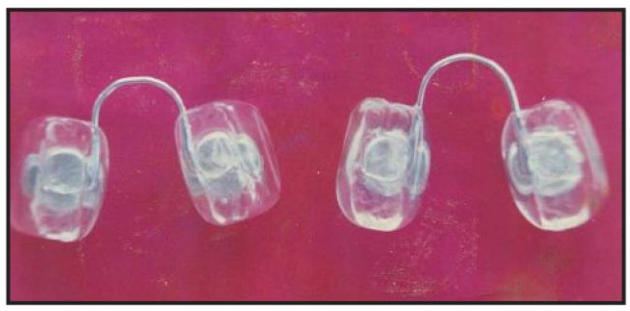


Fig 4: AVC appliance-upper and lower bite block impregnated with magnets

Fig 5: Post treatment extra oral photographs - front and right view

Fig 6: Post treatment intra oral photograph- front, right and left view

CONCLUSION

Even though magnets are expensive, it gives quick and stable results. Barbre and Sinclair achieved a similar bite closing effect with AVC in their study done on 25 open bite cases.[4] The closure of the anterior open bite may be enhanced by one or more of the following modes of action.

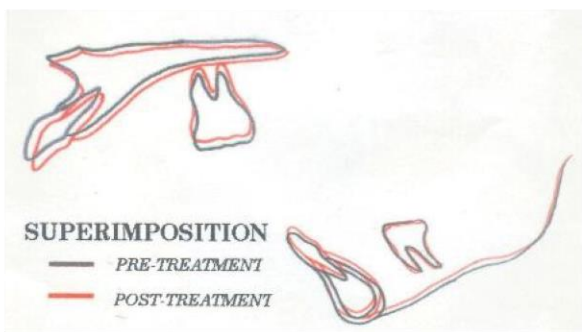
1. The constant intrusive force delivered by AVC.

2. An increased cellular activity that occurs when tissues are subjected to time varying magnetic field and the possibility of microcurrent flow should be considered a positive tissue stimulator with saliva acting as an electrolyte.

An attempt is made to treat a case of dental open bite which is presented in this article. But study should be done with more patients including skeletal open bite cases.

Fig 7: Pre treatment cephalogram

Fig 8: Post treatment cephalogram



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