**Vibhute Class II Correction Appliance**

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**ABSTRACT**

Fixed functional appliances have gained the popularity for growth modification in noncompliant patients, especially hybrid types. But for this, clinicians have to depend on certain commercially available appliances; otherwise components required in fabrication of hybrid type appliances are not routinely available in clinics, which discourage their use. Additionally, these preformed appliances have less scope in changing their length as per patient’s requirement of particular mandibular advancement. This article explains the chairside fabrication of open coil NiTi spring loaded hybrid type fixed functional appliance named ‘Vibhute Class II Correction Appliance’ (VCCA). This custom-made tinier and hygienic design provides stable fixation, less breakages with increased range of mandibular movement involving unrestricted mouth opening. VCCA permits quick chairside fabrication with ease in installation of appliance and is inexpensive.

**Keywords:** Fixed functional appliance, Class II correction, NiTi open coil spring, Mandibular advancement, Growth modification, Fatigue resistant device, VCCA.

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**INTRODUCTION**

Fixed functional appliances (FFAs) are popular for growth modification.\(^1\)\(^2\) Rigid, flexible and hybrid appliances have been introduced, including Herbst\(^a\), Jasper Jumper\(^b\), Eureka Spring\(^c\), Forsus\(^d\), Klapper SUPERspring II\(^e\), Twin Force Bite Corrector\(^f\), Mandibular Protraction Appliance, etc.\(^3\)\(^\text{--}\)\(^10\)

Noncompliant patients require the fixed functional approach. Small and hygienic design, stable fixation, less breakages, wide range of mandibular movement with mouth opening made the hybrid FFA’s popular. Forsus\(^d\) type super-elastic spring-loaded appliances have gained popularity because of their ease in clinical application and expedient design. When considering chairside fabrication, many of the times routinely components are not available for the clinician in practice, which discourage its use, e.g. availability of 0.036” to 0.045” lumen NiTi open coil springs required to be placed over 0.036” or 0.040” mandibular rod. Compliance with use of preadjusted edgewise appliance is also essential, e.g. push rod in Forsus\(^d\) is easy going in placement and removal. For this, with an exception many times clinician has to be dependent on prefabricated design by manufacturers. Chairside quick fabrication of spring loaded FFA from usually available clinical wire and open coil NiTi spring (routinely used in orthodontics to open space for blocked out tooth) components is described here.

**Appliance Construction**

Total length of the appliance is decided by measuring the distance from distal of maxillary headgear tube to the distal of the mandibular canine in desirable advanced mandibular position.

Following things are necessary for the fabrication of the appliance

- 18-Gauge (1.2 mm) needle, internal diameter 0.036”
- 1 mm (0.040”) thick hard-round stainless steel wire\(^g\)
- 0.8 mm (0.032”) thick hard-round stainless steel wire\(^g\)
- NiTi open coil spring (lumen size 0.032”, specifications 0.012” × 0.035”)
- Solder, flux and heat source, e.g. soldering torch.

1. **Maxillary tube assembly**: Take 25 mm long tube made from 18 Gauge (1.2 mm) internal diameter 0.036” needle and approximate it in collateral position along with 1 mm (0.040”) thick hard-round stainless steel wire.\(^g\) Tube is encircled by wire at two places 15 mm apart, for this initially two circles are prepared, tight and small enough to hold needle inserted through them and finally solder them together. Before soldering, the needle tube should

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\(^a\)Herbst, Registered trademark of Dentaurum, Inc., 10 Pheasant Run, Newtown, PA 18940;\(^b\)Jasper Jumper, American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53082;\(^c\)Eureka Spring, 1312 Garden St., San Luis Obispo, CA 93401;\(^d\)Forsus, Unitek (Orthodontic Products (2724 South Peck Road (Monrovia, California 91016;\(^e\)Klapper SUPERspring II, ORTHOdesign, 744 Falls Circle, Lake Forest, Illinois. 60045, USA;\(^f\)Twin Force Bite Corrector, Ortho Organizers Inc, Corporate Headquarters, 1822 Aston Avenue Carlsbad, CA 92008-7306;\(^g\)Leowire, LEONE Spa Orthodontics and Implantology, I-50019 Sesto Fiorentino – FI Via Pa Quaracchi, 50 www.leone.it
have sufficient tightness in circles. Needle tips should be pre-cut to avoid accidental injury, and it should be handled carefully to avoid tube compression, blockage and unwanted bending. Make the wire straight at one end, parallel to the tube. Molar connecting hook is made in the straight section of the wire with a 2 mm offset from tube axis (Figs 1A to E). Care should be taken during the soldering process, wire part adjacent to the assembly should not get annealed, and should have proper tensile properties for the molar connecting hook. Assembly should be immediately quenched after soldering. Diameter of molar connecting hook should be only 1 mm and completely closed. Excess tube should be cut off with a disk, and clogging inside the tube is cleaned with 0.8” wire under tap water. Finally, maxillary tube assembly is polished with fine sand paper.

2. **Mandibular push component**: A 0.8 mm (0.032”) thick hard-round stainless steel wire is straightened about 8 cm and recurved at one end in a S-shape loop manner as shown in Figure 2, to prepare the fetching hook. At the junction of straight part of the push component and fetching hook a drop of solder is placed (at the bend) to form small ‘solder stop’. An 18 mm length of NiTi open coil spring (lumen size 0.032”) is placed on it. ‘Stop’ prevents the slippage of the open coil (Figs 2 and 3). Length of the spring is subject to vary according to the total length of the appliance required. Total length of the spring portion of appliance when spring is passive should comprise 25 to 40% of the entire length of the appliance. Push component should be completely straight to avoid possible friction and resistance inside the tube.

3. **Fetching hook**: It is prepared in the mandibular push component adjacent to the solder stop, which is used to crimp distal to canine in vertical or horizontal circular hook on the mandibular archwire (anneal wire ends for easy crimping and removal) (Figs 2 to 5).

**Fig. 2A**: Preparation of mandibular push component from 0.8 mm stainless steel wire

**Fig. 2B**: Stainless steel wire preferred in preparation of VCCA

**Figs 1A to E**: Steps in preparation of maxillary tube assembly from 1 mm thick stainless steel wire and 18 gauge needle
4. ‘Ball-end L-hook’: It is prepared in 0.8 mm (0.032”) thick wire by putting a round drop of solder at one end; this is used to secure the maxillary tube assembly in 0.045” maxillary tube with insertion of ‘Ball-end L-hook’ from distal of maxillary tube (arrow 5 in Fig. 4) and cinching mesially.

5. Trim posterior tube ends (arrow 4 in Fig. 4) according to patient’s comfort and length of necessary mandibular push component, and it should not poke out from the posterior part of the tube opening. Small metal cutting disks are preferred than the burs for trimming tube/needle. Since, total tube length used decides total length of appliance, it can be varied between 15 and 25 mm but length of appliance can be reduced by trimming off/cutting the tube length anterior to the encircled solder point (arrow 2 in Fig. 4). Similarly, right and left components are prepared. Shape/designs of right side ‘tube assembly’ and ‘push component’ are mirror images of the left side (Fig. 4).

6. Total length of the appliance is the distance between the fetching hook and the molar connecting hook when mandibular push component is completely inserted in the tube with NiTi spring is passive. In fabrication of VCCA, entire length of maxillary tube assembly portion should comprise 60 to 75% that of total length of appliance. Increased length of maxillary tube component decreases chances of dislodgement of mandibular push component on even wide mouth opening. Remaining 40 to 25% is comprised of the spring length (Fig. 4A).

Principles governing appliance installation and performance are the same as those for MPa, Forsus™ and some other hybrid fixed functional appliances. With MPa III and MPa IV 0.045” internal diameter NiTi spring is advocated to be placed over mandibular rod, which is not routinely available in clinic, but 0.032” NiTi open coil is regularly accessible and delivers forces almost equal to Forsus™. Additionally, the force level can be increased by incorporating two springs on same push component where coils get merged with in each other without increase in length of the push component, i.e. number of turns in the coil get doubled with in same length (Fig. 5).
Figs 6A to C: Installed appliance shows the cinching of ball-end hook and mandibular fetching hook

Figs 7A to C: Lower arch movement permitted by the appliance

Figs 8A to G: Appliance installed for Class II correction of a patient. Lateral movements permitted and maximum limit of mouth opening of patient possible without dislodging of mandibular push component from maxillary tube assembly
Installation of Appliance

Make sure that consolidated upper and lower arches have reached a stage of full slot engagement of stainless steel archwires in either 0.018" slot or 0.022" slot. Transverse stabilization of upper molars should be done with transpalatal arch to avoid upper arch expansion, which happens due to the fixed functional appliances. Wires are secured with stainless steel ties rather than e-modules. Lower archwire is provided with a small circular loop distal to canine (for engaging fetching hook), additional lower incisor labial root torque (e.g. MBT, Alexander prescription preferred) and cinch it behind the lower second molar tube.

Wire-end part of fetching hook (of mandibular push component) and Ball-end L-hook is annealed before installation for ease of cinching. Maxillary tube assembly is secured by inserting Ball-end L-hook through molar connecting hook of maxillary tube assembly and through distal of 0.045" maxillary tube (headgear tube). Wire coming from mesial opening of headgear tube is cinched upward, where free end tucked inside molar hooks. Molar bands with headgear tube position having occlusal are preferred for installation of VCCA. Open coil of desired length is loaded on to the mandibular push component and it is inserted through anterior opening of the maxillary tube assembly. Length of the mandibular push component should be kept such that, it should not poke out when the open coil is passive. Fetching hook engagement is carried out by either asking the patient to protrude the mandible or by compressing the mandibular push components. Once the fetching hook is engaged on both sides, asking the patient for gradual mouth opening checks the possibility of dislodgement of the push component from the tube. Mandibular advancement, patient comfort and midlines should be confirmed then final crimping is done with a Weingart plier. This completes the engagement and crimping of fetching hook inside the circular loop of the archwire distal to the mandibular canine. Same procedure is followed for the installation of appliance on the contralateral side (Figs 6 to 8). Then explain the post-appliance placement instructions and prescribe a mouthwash.

Advantages

This spring-loaded customized design provides more scope for chairside alteration in the dimensions of the appliance as per patient requirement unlike the other commercially available devices. The results are similar to those of other commercially available designs used for Class II correction, with the following advantages:

- Appliance length can be changed chairside easily for increase or decrease in mandibular advancement, since, open coil length (arrow 1 in Fig. 4) can be varied, excess tube length anterior to encircled solder point may be reduced (arrow 2 in Fig. 4), position of posterior molar hook (arrow 3 in Fig. 4) can be adjusted, and as per clinician’s requirement.
- Alterable in force levels, since more than two open coils can be placed within each other on same length of mandibular push component to double force level (number of turns of coils doubled with in same length) (Fig. 5).
- Permits wide range of mandibular movement with unrestricted mouth opening.
- Quick, easy chairside fabrication and installation.
- Stable fixation.
- Increased flexibility in the appliance reduces breakages and extra appointments.
- It has versatility to be used with preadjusted edgewise appliances for Class II, III and subdivision correction.
- Small and hygienic design, easy to place and remove from mandibular archwire.
- VCCA is simple and inexpensive.

REFERENCES