

Vibhute Class-II Correction Appliance (VCCA): In-Office Fabrication and Clinical Installation of Appliance

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Abstract

Hybrid fixed functional appliances has gained the popularity for growth modification in noncompliant patients. But for this, clinicians have to depend on certain commercially available appliances. Additionally, these appliances have less scope in changing their length as per patient's requirement of particular mandibular advancement. This article explains the chair-side fabrication of open coil NiTi spring loaded hybrid type fixed functional appliance. This custom made tinier and hygienic design provide stable fixation, less breakages with increased range of mandibular movement involving unrestricted mouth opening. Chair side fabrication is quick, with ease in installation of appliance and is inexpensive.

Key words: Fixed functional appliance, Class II correction, NiTi Open coil spring, Mandibular advancement, Growth modification, fatigue resistant device, VCCA.

Introduction

Fixed functional appliances (FFAs) are popular for growth modification.^{1, 2} Rigid, flexible and hybrid appliances have been introduced, including Herbst*, Jasper Jumper*,Eureka Spring[®], Forsus[®], Klapper SUPERspring II[®], Twin Force Bite Corrector,* Mandibular Protraction Appliance etc.³⁻¹⁰

Tinier and hygienic design, stable fixation, less breakages, wide range of mandibular movement with unrestricted mouth opening made the hybrid FFA's popular. Forsus[®] type super-elastic spring loaded appliances have gained popularity because of its ease in clinical application and expedient design. When considering chair side 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 spring 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[®] is easy-going in placement and removal. For this, with an exception many times clinician has to depend on prefabricated design by manufacturers. Chair-side 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 appliance is decided by measuring distance from distal of maxillary headgear tube to distal of mandibular canine in advanced mandibular position. In fabrication of VCCA entire length of maxillary tube portion should comprise 60%- 70% 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.

Footnote:

*Herbst, Registered trademark of Dentaaurum, Inc., 10 Pheasant Run, Newtown, PA 18940.

*Jasper Jumper, American Orthodontics, 1714 Cambridge Ave., Sheboygan, WI 53082.

[®]Eureka Spring, 1312 Garden St., San Luis Obispo, CA 93401.

[®]Forsus, Unitek Orthodontic Products 2724 South Peck Road Monrovia, California 91016

[®]Klapper SUPERspring II, ORTHOdesign, 744 Falls Circle, Lake Forest, Illinois. 60045, USA.

*Twin Force Bite Corrector, Ortho Organizers Inc, Corporate Headquarters, 1822 Aston Avenue Carlsbad, CA 92008-7306.

[†]Leowire, LEONE S.p.a. Orthodontics And Implantology, I-50019 Sesto Fiorentino – FI Via P. a Quaracchi, 50 www.leone.it

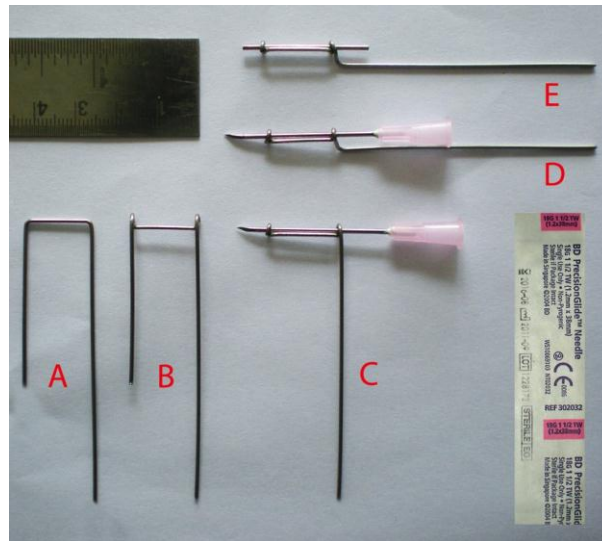


Figure-1: Steps in preparation of Maxillary Tube Assembly from A to E.



Figure-2: Preparation of Mandibular Push Component from 0.8mm (0.032'') stainless steel wire.



Figure-3: Mandibular Push Component loaded with open coil NITI spring and ready to insert through the maxillary tube assembly from anterior opening of tube

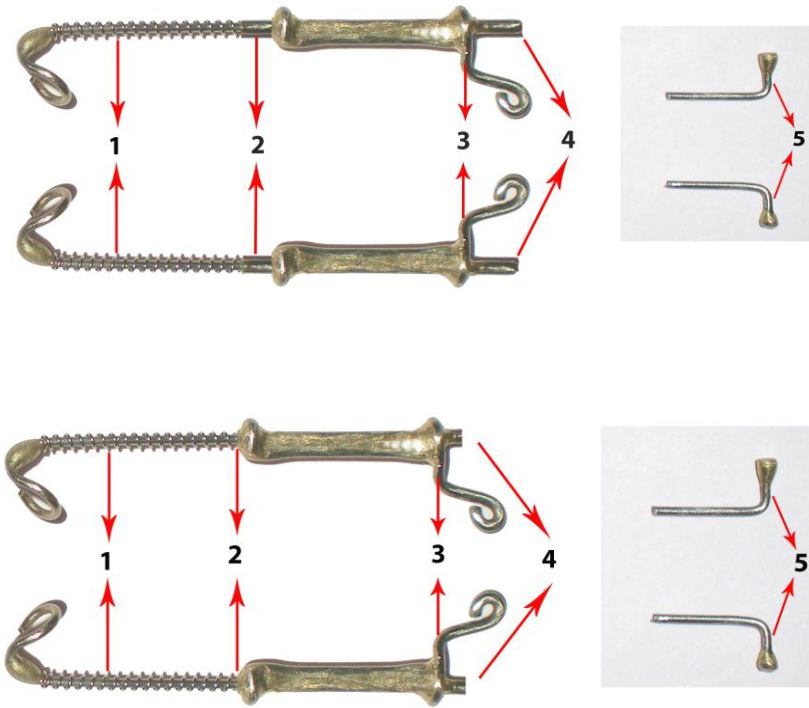


Figure-4: Mandibular Push Component inserted through the maxillary tube assembly, A: length of maxillary tube component outside soldered part may be kept as per patient need and comfort B: length of maxillary tube component may be reduced as shown by arrow 2 and 4.

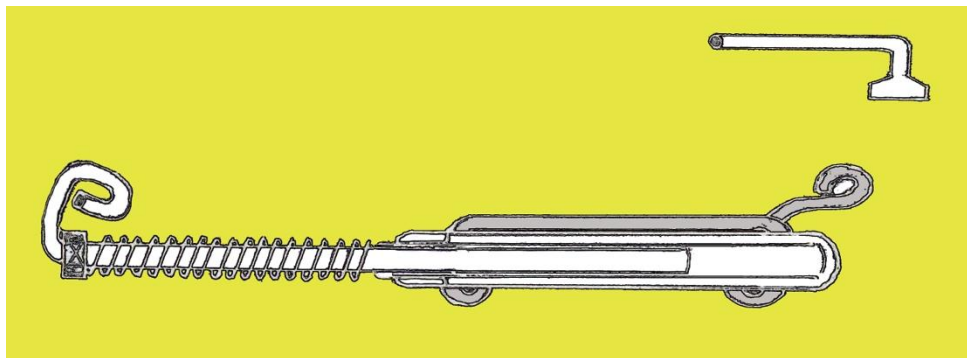


Figure-5: Schematic diagram of appliance including design of 'Ball-end L-Hook'

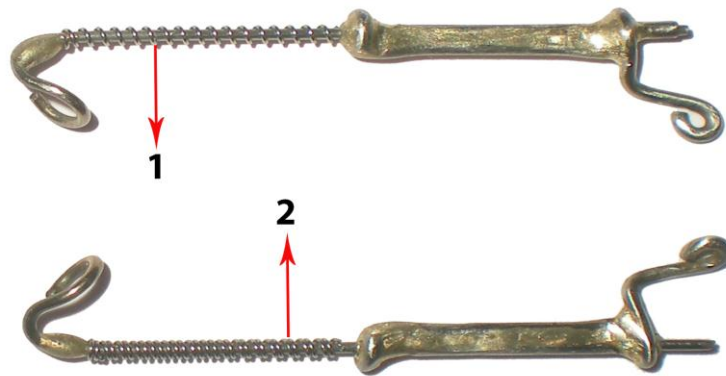


Figure-6: Number of turns of coils doubled with in same length



Figure-7A, 7B, 7C: Installed appliance shows the cinching of ball end hook and mandibular fetching hook.

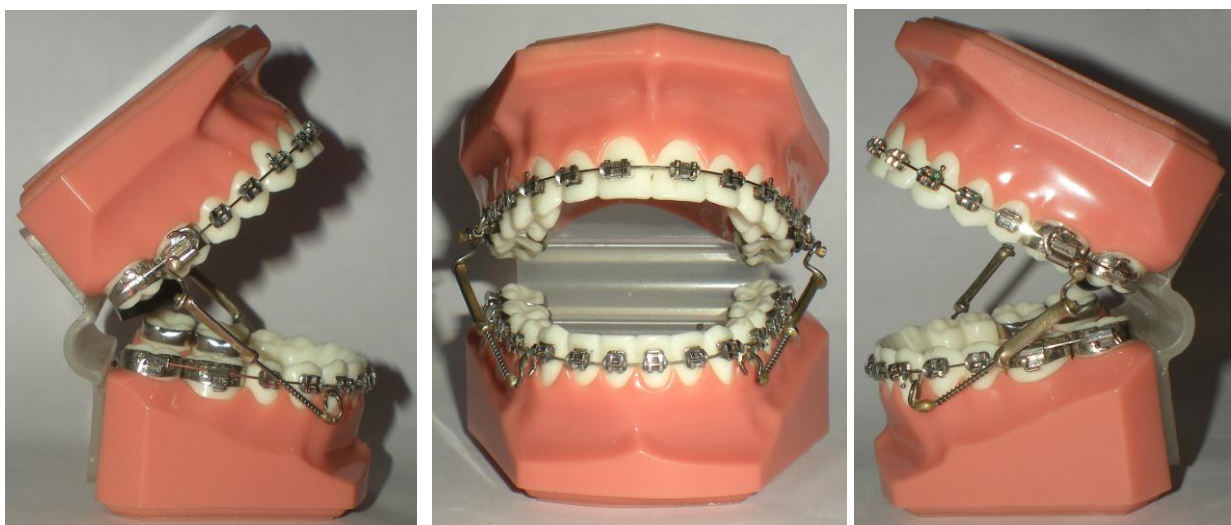


Figure-8A, 8B, 8C: Lower arch movement permitted by the appliance.

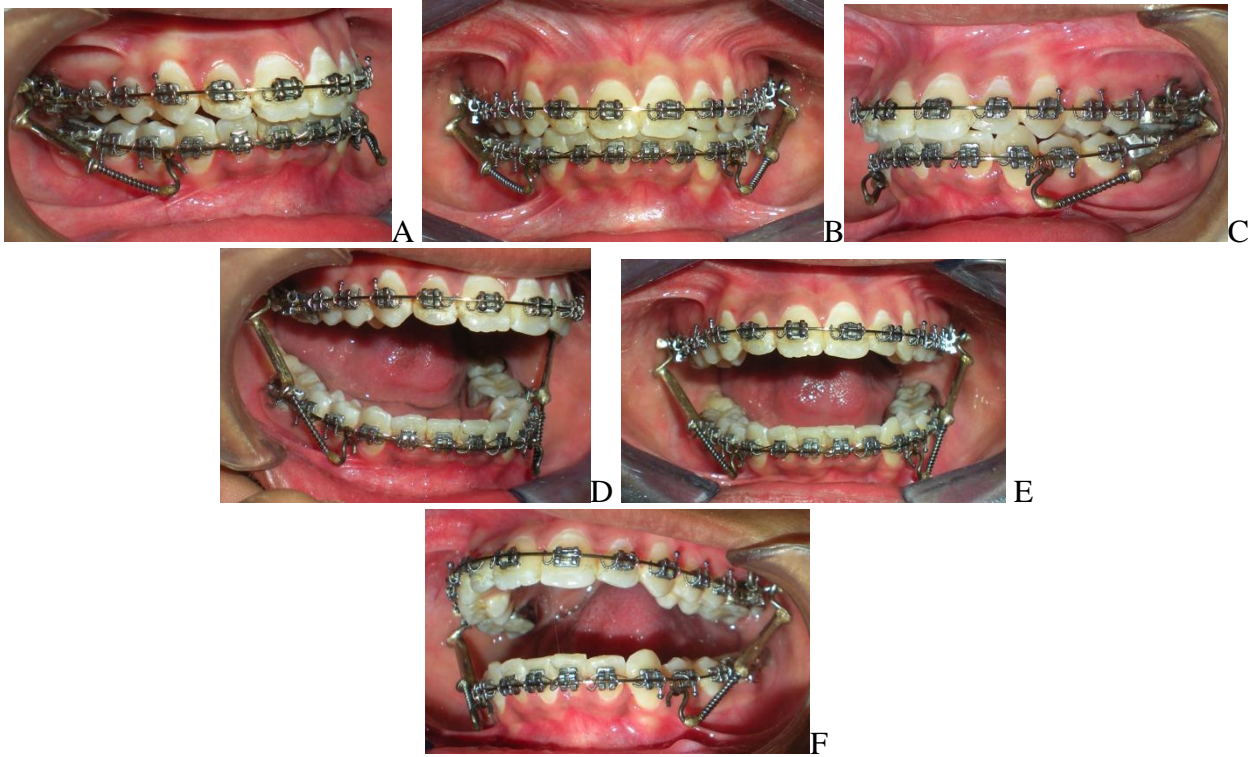


Figure-9A-9F: Appliance Installed for class II correction of a patient.

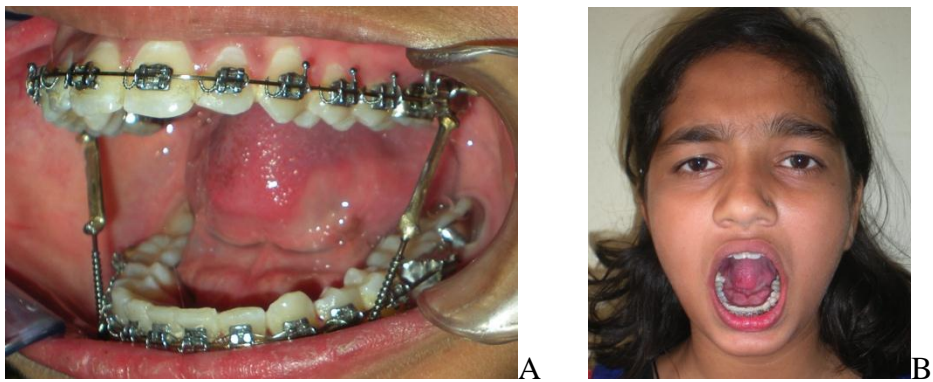


Figure-10A, 10B: Lateral movements permitted and maximum limit of mouth opening of patient possible without dislodging of mandibular push component from maxillary tube assembly.



Figure-11:Pre-treatment (A, C) and post-treatment (B, D) facial photographs

Following things are necessary for fabrication of appliance,

- 18-Gauge (1.2mm) internal diameter 0.036" needle
- 1mm (0.040") thick hard-round-stainless-steel wire^ϕ
- 0.8mm (0.032") thick hard-round-stainless-steel wire^ϕ
- NiTi open coil spring (lumen size 0.032", specifications 0.012"x0.035")
- Solder, flux and flame

1. **Maxillary Tube Assembly:** Take 25mm-long tube made from 18-Gauge (1.2mm) internal diameter 0.036" needle and approximate it in collateral position along with 1mm (0.040") thick hard-round-stainless-steel wire^ϕ. Tube is encircled by wire at two places 15mm apart, for this initially 2 circles are prepared tight and small enough to hold needle inserted through them and finally solder them together. Make the wire at one end straight parallel to tube (Fig. 1). Molar connecting hook is made in straight section of wire with offsetting it from tube-axis by 2mm.
2. **Mandibular Push Component:** 0.8mm (0.032") thick hard-round-stainless-steel wire^ϕ recurved in S-shape loop manner as shown in figure 2, to prepare

fetching hook. At the junction of straight part of push component and fetching hook a drop of solder is placed at bend to form small 'solder stop'. 18mm length of NiTi open coil spring (lumen size 0.032") placed on it. 'Stop' prevents the slippage of open coil (Fig. 2, 3). Length of spring is subject to vary according to total length of appliance required.

3. **Fetching hook** is prepared in mandibular push component adjacent to solder stop, which is used to crimp distal to canine in vertical or horizontal circular hook on mandibular archwire (anneal wire ends for easy crimping and removal) (Fig. 2, 3, 4, 5).
4. **'Ball-end L-hook'** is prepared in 0.8mm (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 posterior tube opening. Since Total tube length used decides total length of appliance, it can be varied between 15 to 25mm but length of appliance can be reduced by trimming off / cutting tube length anterior to encircled solder point

(Arrow 2 Fig. 4). Shape / designs of right side 'Tube assembly' and 'Push component' are mirror images of left side (Fig. 4).

Principles governing appliance installation and performance are same as those for MPA, Forsus[®] and some other hybrid fixed functional appliances. With MPA 3 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" / 0.030" NITI open coil is regularly accessible and delivers forces almost equal to Forsus[®]. Additionally, 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 that push component, i.e. number of turns in the coil get doubled with in same length (Fig. 6).

Installation of Appliance: Wire-end-part of fetching hook 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 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 occlusal are preferred for installation of VCCA. Open coil of desired length is loaded on mandibular push component and it inserted through anterior opening of maxillary tube assembly. Length of mandibular push component should be kept such that, it should not poke out when open coil is passive. Then fetching hook is engaged inside circular loop of archwire distal to mandibular canine and crimped. Same procedure is followed for the installation of appliance on other side also (Fig. 7 to Fig 10).

Advantages

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

- Appliance length can be changed chair side easily for increase or decrease in mandibular advancement, since, open coil length (Arrow 1 Fig. 4) can be varied, excess tube length anterior to encircled solder point may be reduced (Arrow 2 Fig. 4), position of posterior molar hook (Arrow 3 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 chair side fabrication and placement.
- Stable fixation,
- Increased flexibility in appliance reduces breakages and extra appointments,
- It has versatility to use with preadjusted edgewise appliance for Class II or Class III correction.
- Tinier and hygienic design, easy to place and remove from mandibular arch wire,
- VCCA is simple and inexpensive.

References:

1. McSherry, P.F. and Bradley, H.: Class II correction-reducing patient compliance: a review of the available techniques, *J. Orthod.* 27:219-225, 2000.
2. Bilgiç, F.; Hamamci, O.; and Baseman, G.: Comparison of the effects of fixed and removable functional appliances on the skeletal and dentoalveolar structures, *Aust. Orthod. J.* 27:110-116, 2011.
3. Devincenzo J.: The Eureka Spring: A New Interarch Force Delivery System, 31:454-467, 1997.
4. Coelho Filho, C.M.: The Mandibular Protraction Appliance No. 3, *J. Clin. Orthod.* 32:379-384, 1998.
5. Klapper, L.: The superspring II: a new appliance for non-compliant Class II patients, *J. Clin. Orthod.* 33:50-54, 1999.
6. Bowman, S.J.: Class II combination therapy (distal jet and Jasper Jumpers): a case report, *J. Orthod.* 27:213-218, 2000.
7. Coelho Filho, C.M.: The Mandibular Protraction Appliance No. IV, *J. Clin. Orthod.* 35:18-24. 2001.
8. Rogers, M.B.: Herbst appliance variations, *J. Clin. Orthod.* 37:156-159, 2003.
9. Sood, S.: The Forsus Fatigue Resistant Device as a fixed functional appliance, *J. Clin. Orthod.* 45:463-466, 2011.
10. Karacay, S.; Akin, E.; Olmec, H.; Gurton, A.U.; and Sagdic, D.: Forsus Nitinol Flat Spring and Jasper Jumper corrections of Class II division 1 malocclusions, *Angle Orthod.* 76:666-672, 2006.