Uprighting of mandibular second molars with the sectional modified Loca system

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A new way to upright the mandibular second molar is described. The principles of the Loca system, originally used for molar distalization, are employed in the mandibular arch. Orthodontics (Chic) 2013;14:e118–e125. doi: 10.11607/ortho.847

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Tooth impaction is a common clinical occurrence that may involve any tooth in the dental arch. The most often impacted teeth, in order of frequency, are the maxillary and mandibular third molars, the maxillary canines, the mandibular second premolars, and the mandibular second molars.1-3 The incidence of second molar impaction revealed by panoramic radiograph studies has been reported as 0.03%4 to 0.04%5 of all impacted teeth.

Advantages of impacted molar uprighting and extrusion are functional, periodontal, and restorative. Uprighting second molars may avoid occlusal plane shortening that may occur from impacted tooth loss, especially in cases of unpredictable third molar position. Moreover, unopposed teeth have a tendency to overerupt. Molar uprighting provides benefits in terms of periodontal health since the elimination of the pseudopockets helps plaque control in the area.6

Since proper oral hygiene is difficult in the area of the impacted teeth, caries may easily occur. Furthermore, undiagnosed second molar impaction may damage the distal root of the first molar.7 All impacted mandibular second molars are associated with a lack of space in the arch due to inadequate mandibular growth, an undesirable axial inclination, or orthodontic treatment mechanics. The most important iatrogenic factors include an incorrectly fitted band cemented on the first mandibular molar, prevention of the mesial shift of the first permanent molar caused by a lip bumper or lingual arch therapy, and distal movement of the mandibular first molar during the mixed dentition stage.7-9

A simple, effective, and efficient way to upright impacted mandibular second molars has been developed. The appliance is called the sectional modified Loca system because of the principles of the maxillary distalization developed by Locatelli and Gianelly.10,11
A common strategy to correct Class II malocclusions by a nonextraction protocol is to move the maxillary molars distally in the initial stage of the treatment to convert the Class II molar relationship into Class I. The Loca system \cite{10,11} appliance makes use of a 0.018 × 0.025–inch nickel titanium (NiTi) wire (Neo Sentalloy, GAC), which should produce a constant amount of force. To move molars distally with this wire, a loop that opens during deactivation is formed in the wire. In consideration of the wire elastic memory, the loop is made as follows: two stops are fixed on the archwire, one distal of the bracket on the first premolar and the other one at the terminal part of the molar tube. Since the space between the stops is 5 to 6 mm longer than the space between the bracket and mesial aspect of the molar tube, the molars are moved distally as the wire flattens to assume its original shape (Fig 1).

The sectional modified Loca system exploits the elastic memory of a NiTi wire not to distalize maxillary molars but to upright impacted mandibular molars. A heat-activated .017 × .025–inch sectional superelastic NiTi wire is fixed between the mandibular first and second molars. In this case a stop is fixed on the archwire at the terminal part of first molar tube, and a molar tube (or an eyelet) is bonded vertically on the second molar crown. When the sectional is inserted into the molar tubes a loop is formed because the NiTi wire length is longer than the distance from the first molar tube to the second molar tube.

A 0.020-inch Australian or 0.019 × 0.025–inch stainless steel wire should be applied in the mandible, from left first molar to right first molar, in order to control anchorage and limit incisor proclination. For this purpose cinch-backs, tie-backs, or figure eight ligature should be used.

Fig 1  Loca system. (a) Stops crimped immediately distal to second premolar bracket and 5 to 7 mm distal to anterior opening of molar tube. (b) Wire inserted into molar tube and first premolar bracket, with excess deflected gingivally into buccal fold. (c) Distal molar movement as wire returns to original shape.
CASE REPORT

A 9-year-old female patient showed a skeletal Class I occlusion with a hypodivergent pattern and a dental Class II malocclusion with space deficit in the maxillary and mandibular arches. Overbite and overjet were increased, and the lips were not competent (Figs 2 to 4).

Treatment objectives were leveling and alignment of the maxilla and mandible and correction of overbite, overjet, and Class II molar relationship. A straightwire appliance was applied, and Class II elastics were planned to correct the dental ratios while 0.019 × 0.025-inch stainless steel archwires were placed in both the arches. During orthodontic treatment the panoramic radiograph revealed impacted mandibular second molars (Fig 5).

After the third molar extractions, second molar uprighting was carried out with a 0.017 × 0.025-inch heat-activated NiTi sectional wire, which was fixed between the mandibular first and the second molars (Fig 6). In the mandibular arch a 0.020-inch Australian archwire was lightly cinched distally to the first

Fig 2  Pretreatment extraoral photographs.
molars in order to control anchorage and limit incisor proclination. During the uprighting phase a lingual mandibular retainer was bonded from canine to canine in order to support anchorage (Fig 7). As soon as the buccal surface of the
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second molars was sufficiently exposed, a molar tube was bonded, and a longer archwire was placed. In this way the molar uprighting could proceed with better control of the posterior arch form. Finally a 0.019 × 0.025-inch stainless steel archwire improved the mandibular second molar positions while also correcting their buccolingual inclination.

Fig 5  The panoramic radiograph, taken during treatment, shows the impacted mandibular second molars.

Fig 6  Intraoral modified Loca system at the beginning of orthodontic uprighting.

Fig 7  Intraoral modified Loca system with bonded lingual retainer at the end of orthodontic uprighting.
TREATMENT RESULTS

After 24 months of treatment, the patient showed Class I dental ratios with correct overbite and overjet. Also intercuspation appeared quite satisfactory. The panoramic radiograph showed good root parallelism, and the mandibular second molars were fully uprighted (Figs 8 to 10).

DISCUSSION

The sectional modified Loca system seems to provide good control of mandibular second molars during uprighting. Furthermore, continuous force and corporeal movement should occur during impacted molar uprighting. This appliance, which proved to be very simple to fabricate and comfortable, may be used anytime during treatment and does not require the patient’s compliance.
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The choice of a heat-activated instead of a superelastic NiTi had the aim of producing a mild force, which should be comparable to the one expressed by the 0.018 × 0.025-inch NiTi (Neo Sentalloy) of the original appliance. Cinch-backs and a lingual retainer should be used to achieve good anchorage.

Fig 9  Posttreatment intraoral photographs.

Fig 10  Posttreatment panoramic (a) and lateral cephalometric (b) radiographs.
control and avoid excessive mandibular incisor proclination. In the mandibu-
lar arch a 0.019 × 0.025–inch stainless steel archwire with metallic tie-backs
should be preferred to the 0.020-inch Australian archwire with cinch-backs be-
cause it may provide better control over inclination.

Several approaches have been proposed for the uprighting of impacted
mandibular second molars. Most of these appliances are efficient and don’t
require compliance, but the clinician may sometimes experience some difficul-
ties in applying them. For instance, miniscrews provide excellent anchorage for
tooth movement but require surgery, even if it is minor.

If correctly performed, the sectional modified Loca system may prevent the
soft tissue irritation that can occur with the complex configurations of wire of-
ten used in such cases. This technique is indeed a closed system that does
not require extended lengths of potentially irritating distal wire. This uprighting
system can be a viable alternative to bulky fixed appliances, such as the distal
jet, that require orthodontic technician support.

CONCLUSIONS

The sectional modified Loca system, which proved easy to fabricate and ac-
tivate, represents an efficient way to upright impacted mandibular second
molars. The light, continuous force of the superelastic NiTi wire efficiently dis-
engages impacted teeth with a satisfactory tridimensional control and reduces
dependence upon patient compliance.

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