# Mandibular molar uprighting using mini-implants: Different approaches for different clinical cases—Two case reports

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***Aim:*** *To detail two different clinical protocols and case studies using mini-implant anchorage developed to respond to certain clinical conditions.* ***Methods:*** *Two clinical protocols are described to upright mesially tilted mandibular molars. In the first protocol, a single mini-implant is inserted distally to the molar to be uprighted, and an elastic traction chain is applied to the tooth. In the second clinical approach, two mini-implants are inserted mesially. A screw-suspended TMA sectional archwire is applied (Derton-Perini technique). Two cases, descriptive of the two different treatment protocols, are described. In the first case, the mandibular right second premolar was missing and the adjacent first molar needed to be uprighted. A single screw was inserted distally to the first molar, and an elastic chain was applied. In the second case, the mandibular left second molar was missing and the third molar needed to be uprighted. Two mini-implants were inserted mesially and a fully screw-supported sectional archwire was used to upright and bodily mesialize the third molar.* ***Results:*** *Both uprighting approaches uprighted the molar axis without loss of anchorage.* ***Conclusion:*** *The two approaches to mandibular molar uprighting, developed as rational responses to different clinical cases, were both found to be effective.* ORTHODONTICS (CHIC) 2012;13:138–145.

Key words: *mandibular molar uprighting, mini-implants*

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Mandibular molar uprighting is a great aid in creating ideal conditions for successful interdisciplinary treatment. Nevertheless, the various conventional orthodontic approaches used to achieve such a movement have all been plagued to a greater or lesser extent by the following issues: extrusion of the molar to be uprighted, unwanted movement of the anchorage unit, the need for bulky appliances, the frequent need of accessories to strengthen anchorage, and long treatment time.

However, in recent years, mini-implants have become a common method of obtaining effective skeletal anchorage,[1–13] and various authors have successfully used them in molar uprighting.[14–19] A technique previously described in literature is the Derton-Perini tecnique.[20] This skeletal anchorage technique uses sectional archwires directly inserted into the slots on the head of the mini-implant. This allows clinicians to move the mandibular molars with no bonding of other teeth and without patient compliance. Using a direct-bonded molar tube, good control of the first, second, and third order can be achieved.

The aim of the present study was to illustrate the indications and clinical protocols of two different techniques to upright mandibular molars using mini-implants without loss of anchorage.

## METHODS

### Case 1 indications

This approach (approach 1) involved the preprosthetic uprighting of a mandibular molar by elastic traction using a mini-implant vertically inserted into the retromolar region of the alveolar bone crest. It was developed in response to the following conditions:

- The absence of systemic pathologies that could aggravate periodontal disease or hinder bone metabolism
- Good patient motivation and adequate degree of collaboration
- Good oral hygiene
- Sufficient space between the distal wall of the molar and the most anterior point of the mandibular ramus
- Thin soft tissue covering and/or postextraction scar bridle in the retromolar region
- Good accessibility for oral hygiene
- Lack of active periodontal disease

The approach was inspired by previous uprighting systems using a pulling force from the distal side. It requires elastic chains and direct anchorage provided by a mini-implant inserted distally to the molar to be uprighted.

The clinical protocol to be employed is as follows (Figs 1 and 2):

- Insert the mini-implant in a crestal position of the retromolar area, distally to the tooth to be uprighted
- Ensure the mini-implant is 2 mm in diameter to prevent root lesions, provide optimal stability, and reduce the risk of mini-implant deformation or breakage
- Evaluate the insertion site with periapical or panoramic radiographs and consider the use of a simple radiographic stent
- Select the longest possible mini-implant compatible with the distance of the inferior alveolar nerve (IAN) canal
- Insert the mini-implant with a distal tip of the head to counteract the pull-out effect of the elastic force
- Using resin occlusal splints to achieve arch disocclusion by raising the bite

Fig 1 Lateral view of the uprighting of the mandibular right second molar.

Fig 2 Radiographic view of the uprighting of the mandibular right second molar.

Figs 3 and 4 The 0.018 × 0.025-inch TMA sectional archwire used for uprighting.

## Case 2 indications

The second clinical approach (approach 2, Derton-Perini technique) involved the preprosthetic uprighting of a mandibular molar by means of two mini-implants with slotted heads inserted mesially to the molar to be uprighted and a sectional orthodontic archwire threaded through the slots. Cases suitable for such treatment feature:

- The absence of systematic pathologies that could aggravate periodontal disease or hinder bone metabolism
- Patient motivation and a good degree of collaboration
- Good oral hygiene
- Insufficient space between the distal wall of the molar and the most anterior point on the mandibular ramus
- Abundant soft tissue covering and/or postextraction scar bridle in the retromolar region
- Poor accessibility for oral hygiene
- Lack of active periodontal disease

The direct mesial anchorage approach (approach 2) involves the use of two mini-implants inserted mesially to the molar to be uprighted and a sectional archwire threaded through them. It was inspired by the previous uprighting techniques using a pushing force from the mesial side.

The clinical protocol to be employed in these cases is as follows (Figs 3 and 4):

- Insert two mini-implants with slotted heads in a buccal position in front of the molar to be uprighted
- Ensure insertion angle is approximately 60° to 70° to the bone surface
- Use mini-implants 2 mm in diameter in edentulous spaces or 1.5 mm in diameter in interradicular areas

Fig 5 Completely collapsed space.

- Make sure the mini-implant engages both the cortical and cancellous bone
- Either band or directly bond a 0.022-inch labial tube to the molar to be uprighted
- Model a 0.018 × 0.025-inch beta-titanium alloy (TMA) sectional archwire so that it is housed passively in the slotted mini-implant heads—create a loop that allows uprighting during distalization, mesialization, or intrusion, or one that simply permits third order and vertical control of the molar in question

### Case 1—uprighting with space opening (approach 1)

This case involved a missing mandibular right second premolar that had led to marked mesial migration of the first molar. The situation was further complicated by a considerable degree of mesioinclination of its long axis. Contact had formed between the mesial surface of this tooth and the distal side of the mandibular right first premolar, completely closing the edentulous space left by the missing second premolar (Fig 5).

The treatment plan developed by the orthodontic and periodontal/prosthetic specialists involved the preprosthetic uprighting of the first molar by means of a 2 × 9-mm mini-implant and two steel cleats bonded to the lingual and labial sides of the crown of the tooth to be uprighted. To achieve maximum primary stability of the anchoring mini-implant, which was subjected to immediate loading, the external oblique line of the retromolar trigone (a highly cortical area) was used as the site for insertion of the mini-implant until the latter rested against the underlying bony plane. Care was taken to position the mini-implant at a sufficient distance from the distal wall of the tooth to allow the considerable dental movement required to open the space for a prosthesis.

Traction was begun with elastics (small-space chain, RMO Morita) (Fig 5) to achieve initial movement. The clinical protocol of approach 1 was employed, and progress was checked every 3 weeks, with particular attention given to:

- Mini-implant stability (retightening by hand as necessary with a screwdriver)
- Oral hygiene
- The health of the mucosa surrounding the mini-implant head
- Hygiene of the tooth to be uprighted (scaling and root planing as necessary)
- Selective milling of the first molar as necessary to eliminate any harmful precontacts in occlusion
- Replacement of elastic chains

After 7 months, the mandibular right first molar had returned to its original position, leaving sufficient space for a prosthetic implant (Figs 6 and 7). This was achieved in a reasonable amount of time, without the bulky orthodontic appliances or a great deal of patient collaboration (except for cleaning procedures).

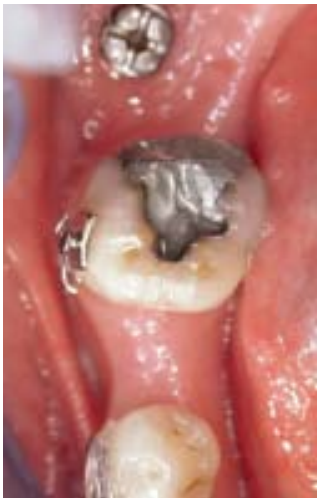

Fig 6 *(above)* Uprighting of the mandibular right first molar (lateral view).

Fig 7 *(right)* Uprighting of the mandibular right first molar (occlusal view).

Fig 8 Prosthetic implant at the mandibular right second premolar (lateral view).

Fig 9 Prosthetic implant at the mandibular right second premolar (radiographic view).

Fig 10 Radiographic view of the initial uprighting of the mandibular right first molar.

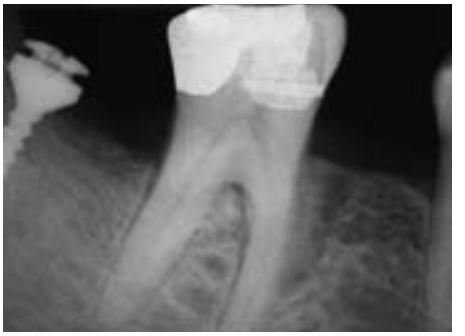

Fig 11 Radiographic view of uprighting of the mandibular right first molar after 14 weeks of treatment. Note the considerable new bone deposition mesial to the tooth.

Subsequently, an implant (Brånemark Nobel Biocare WP, 13 mm) was inserted into the edentulous space. Upon osteointegration, the fixture was uncovered and used to anchor the permanent prosthesis used to replace the missing second premolar (Figs 8 and 9).

Radiographs taken to check the progress of treatment (Figs 10 and 11) show the deposition of new bone that occurred during uprighting, a well-known phenomenon.[21,22]

Fig 12 Dental and periodontal destruction of the mandibular left second molar due to impacted third molar (detail from a panoramic radiograph).

Fig 13 *(left)* Lateral view of marker system—brass wire soldered to steel section.

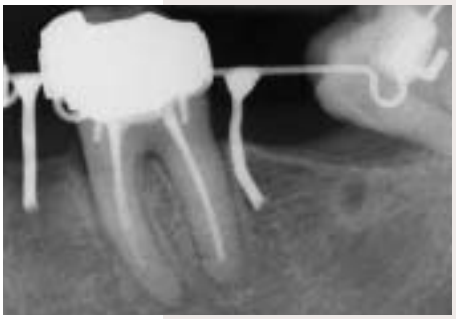

Fig 14 *(right)* Radiographic view of marker system—brass wire soldered to steel section. Note angular periodontal defect on mesial side of tooth.

Fig 15 Lateral view of mini-implants positioned mesially and distally to the mandibular left first molar.

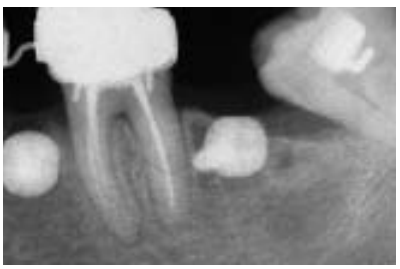

Fig 16 Radiographic view of mini-implants positioned mesially and distally to the mandibular left first molar.

## Case 2—uprighting with space closure (approach 2)

The initial clinical outlook was particularly poor. The mandibular left second molar required surgical extraction, since the adjacent impacted third molar had caused dental and periodontal degradation (Fig 12). After extraction of the second molar, marked mesial inclination of third molar, whose root apexes were positioned near to the base of the mandibular ramus and whose crown was tilted mesially, was seen. The long axis of the mandibular third molar formed an angle of 51 degrees with the axis of the first molar. The condition of the periodontium mesial to the third molar was poor. In fact, a 6-mm pocket was discovered, in addition to bleeding on probing (BoP).

After the extraction site had healed, the treatment plan was designed to achieve controlled uprighting, intrusion, and bodily mesialization of the third molar with no unwanted movement of other teeth, little need for patient collaboration, and no undue unsightliness or discomfort.

To move the third molar mesially to replace the extracted second molar, a pair of slotted-head mini-implants were positioned mesially to the molar to be uprighted. A sequence of sectional archwires were threaded directly through the slots in the mini-implant heads.

At the outset, a presurgical study of the area in question was performed using a system of markers made of brass wires soldered to steel sectional archwires (Figs 13 and 14). Two 9 × 2-mm mini-implants were inserted between the roots of the second premolar and first molar (Figs 15 and 16). The first archwire section, which featured a running loop (0.018 × 0.025-inch TMA), was then manufactured and activated by threading it through the slots in the mini-implant heads.

Fig 17 The 0.018 × 0.025-inch TMA sectional archwire with running loop, and uprighting and intrusion of the mandibular left third molar after 4 months.

Fig 18 Mini-implants and final 0.018 × 0.025-inch TMA section. Note the uprighting of the third molar and space closure after 9 months.

The clinical protocol of approach 2 was subsequently employed. Progress was checked every 4 weeks, with particular attention given to:

- Mini-implant stability, oral hygiene, and health of the mucosa surrounding the mini-implant head
- Status and hygiene of the tooth being uprighted (scaling and root planing as necessary)
- Selective milling of the third molar as necessary to eliminate any harmful precontacts in occlusion
- In situ activation of the uprighting loop with Merrifield pliers and activation/modification of the sectional wire ex situ, creating first, second, and third order bends

Uprighting and intrusion were nearly complete within 4 months (Fig 17). At this point, a second sectional wire (0.018 × 0.025-inch TMA), also featuring a loop, was created so that uprighting and intrusion could be completed, but also that bodily mesialization of the molar could be achieved. Finally, to achieve complete space closure, the mini-implant distal to the first molar was removed and replaced with one (1.5 × 8 mm) inserted between the mandibular left first and second premolar. The final phase of molar advancement was achieved in 12 weeks by means of a final sectional wire (0.018 × 0.025-inch TMA) featuring a running loop (Fig 18).

The position of the mandibular left third molar was perfected by means of a continuous stainless steel archwire (0.019 × 0.025-inch), following removal of the mini-implant. At debonding, after 6 months of movement, the third molar had reached the desired position, in place of the extracted second molar.

A porcelain-fused-to-gold crown was then placed on the first molar (Fig 19). The roots of the first and third molars were satisfactorily parallel at the time, and the periodontal condition of the third molar had markedly improved. In fact, a radiograph (Fig 20) showed a 3-mm reduction in the pre-existing defect mesial to the third molar. Furthermore, BoP was absent.

## DISCUSSION AND CONCLUSION

The cases described illustrate how the use of the two different uprighting approaches using mini-implant anchorage, chosen on a case-by-case basis according to the initial clinical picture, can efficiently upright mesially inclined mandibular molars, without complex, bulky appliances or anchorage loss.

In the first case, effective repositioning of the mandibular right first molar was achieved within 7 months, creating sufficient space for prosthetic implantation in the edentulous space created by the missing second premolar. In the second case, the use of sectional archwires threaded directly through the slotted heads

Fig 19 The finished case after 10 months of treatment and a porcelain-fused-to-gold crown fitted on the mandibular left third molar.

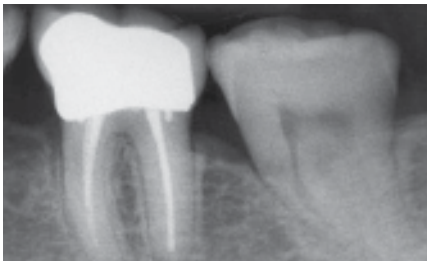

Fig 20 Posttreatment radiograph.

of the mini-implants allowed orthodontic movement that would be particularly difficult to achieve without skeletal anchorage. Thus, satisfactory three-dimensional control of the tooth was achieved without unwanted reactionary forces on the other teeth. At the end of the orthodontic treatment, the mandibular left third molar was prosthetically rehabilitated. As shown on the final radiograph, the condition of the periodontium around this tooth had dramatically improved.

It must be noted that the teeth uprighted and the amount of space managed are similar in both cases described here. Nevertheless, these techniques are less sensitive to anchorage loss and undesired movement.

The two approaches to mandibular molar uprighting were both found to be effective.

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