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The Miniplate with Tube for Skeletal Anchorage

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Anchorage control has always been a difficult and unpredictable challenge for orthodontists.1 Unlike headgear, which relies on patient compliance to achieve tooth movement,2 implants provide true stationary anchorage, allowing treatment to proceed more rapidly with highly predictable results.3

Various types of implants have been tested for orthodontic anchorage: vitallium screws, vitreous carbon, bioglass-coated aluminum oxide implants, stainless steel plates and screws, and Branemark implants.4,5 Miniscrews and miniplates have been found to have advantages over cylindrical endosseous implants and disc-shaped onplants,6,7 including ease of manipulation, ability to withstand immediate force loading, and minimal irritation of the oral tissues.1 Although miniplates require flap surgery, they produce better anchorage than miniscrews, which have been associated with intrusion of the lower posterior segments when used for skeletal anchorage.8

C-Tube Design

As we gained clinical experience with miniscrews and miniplates, we realized that the attachment of an orthodontic tube to a miniplate would greatly improve the versatility of the rigid anchorage system. A round .036" tube with a hook was selected, instead of a rectangular slot, to minimize torque in the archwire. The tube was soldered to one end of a miniplate, and the assembly was gold-cast to build a prototype of what we called the C-Tube (Fig. 1).

Case Report

A 10-year-old female in the permanent dentition presented with a Class I malocclusion (Fig. 2). Both arches were severely crowded, narrow, and tapered with the canines blocked out and superiorly positioned. The patient was a mouthbreather under treatment for rhinitis; her lower lip was protrusive, and she displayed lip incompetence in the resting position. Her face was long, slightly asymmetrical in the frontal view, and convex in profile.

Cephalometric analysis (Table 1) indicated a Class II skeletal discrepancy (ANB = 5.5°) with slight maxillary retrusion (SNA = 78.5°). The short ramus (40mm) resulted in an excessively steep mandibular plane (FMA = 41°) and significant retrognathia relative to the cranial base (SNB = 73°).

A miniplate with C-Tube was fixed in each quadrant with titanium miniscrews after a buccal mucosal flap was raised (Fig. 3). The tube end of the plate was left exposed over the attached gingiva. In the maxilla, C-Tubes were placed between the second premolars and first molars; in the mandible, between the first and second molars.

The first premolars were extracted, and only the anterior teeth were bonded (Fig. 4). Canine retraction was started immediately with elastics and .016" nickel titanium leveling archwires. A month and a half later, rectangular wires were placed to control the canine positions. A transpalatal

bar with extensions to the second premolars was bonded initially, but was removed after two months of treatment because the extraction spaces closed rapidly (Fig. 5).

Three of the C-Tubes held secure throughout the treatment, but the one in the upper right quadrant became mobile by the end of the sixth month (Fig. 6). Inflammation could be seen in the area where the C-Tube loosened.

After six months of treatment, the patient had to move away, and her parents asked that the C-Tubes and appliances be removed. Hawley-type retainers were delivered.

A reasonable alignment was obtained during this curtailed treatment. A Class I canine relationship was achieved, and the Class I molar relationship was maintained (Fig. 7). Because of the clockwise skeletal pattern and the severity of crowding, the profile was still somewhat convex, but the lip strain was greatly reduced, so that the mentolabial fold appeared. The final panoramic radiograph showed parallel roots. Cephalometric superimpositions confirmed the inferior movement of the mandible, consistent with dolichofacial growth. The incisors were slightly retracted in both arches, and molar eruption was within a normal range.

Discussion

With the use of miniplates, the upper posterior segment, normally used as the anchorage unit, was uninvolved. The mandible did not rotate clockwise during treatment, even in this high-angle case. FMA was reduced from 41° to 40°. Therefore, the system seems to be especially advantageous in cases where maintenance of the posterior occlusion is desirable.

Because the C-Tube can become mobile in the presence of soft-tissue inflammation, patients should be instructed to keep good oral hygiene, especially around the implants. In this case, the 45° cephalogram and the panoramic radiograph showed that the loose C-Tube had been placed at an angle (Fig. 6), while the other three were placed relatively parallel to the molar roots. Since the loosening did not occur initially, it might have been secondary to the inflammation or due to torsion from the archwire.

Conclusion

The C-Tube allows the clinician to control the direction of force without soldered extensions or hooks, and also to control the positions of individual teeth. Our experience in this and other cases has shown that the anchorage system is sufficient to withstand en masse retraction of the six anterior teeth. Because of the simplicity of the appliance and the expedience of treatment, side effects such as dental caries and periodontal damage have seldom occurred. •

FIGURES

Fig. 1 Prototype gold-cast C-Tubes. Position of round tube can be modified depending on treatment

goals.

Fig. 2 10-year-old female patient with crowded Class I malocclusion before treatment.

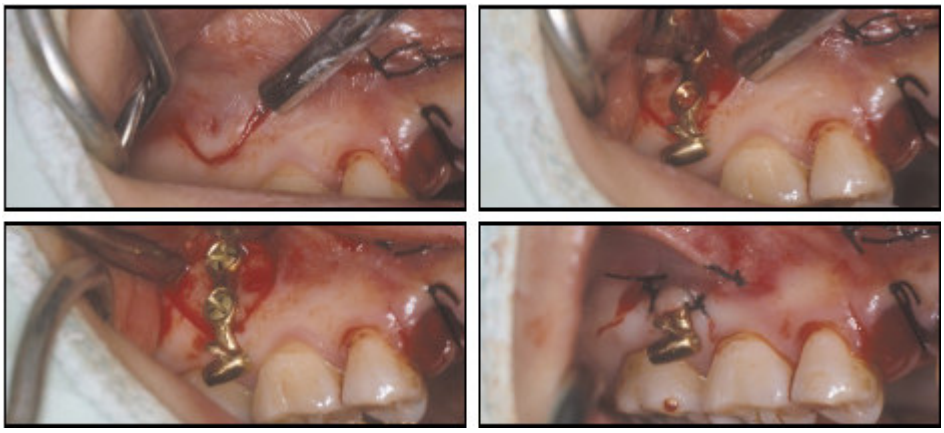

Fig. 3 Mucosal flap raised, and miniplate with C-Tube attached with titanium miniscrews (different patient).

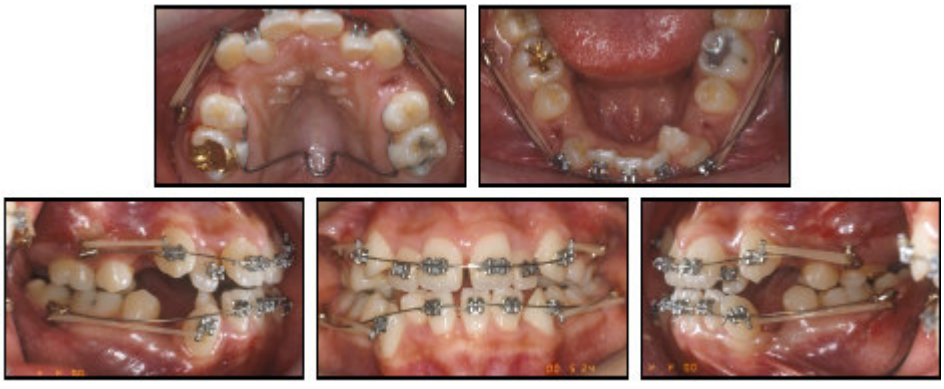

Fig. 4 Initial canine retraction with elastics and .016" nickel titanium leveling archwires.

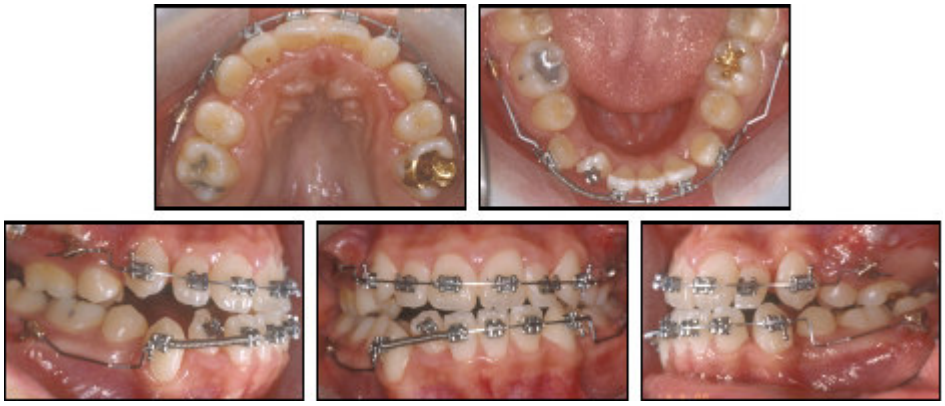

Fig. 5 After two months of treatment.

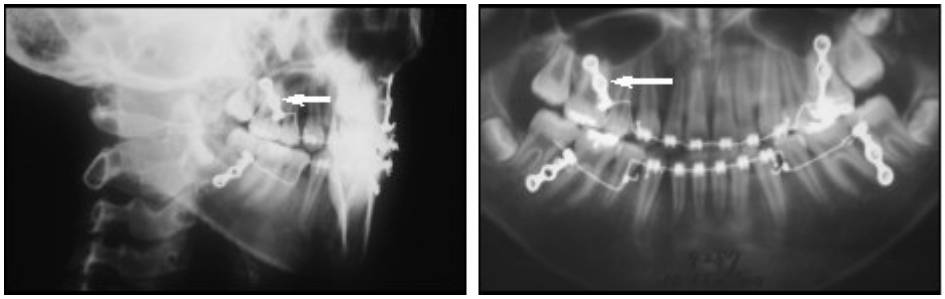

Fig. 6 Loose C-Tube (arrows) shown by 45° cephalogram and panoramic radiograph taken in sixth month of treatment.

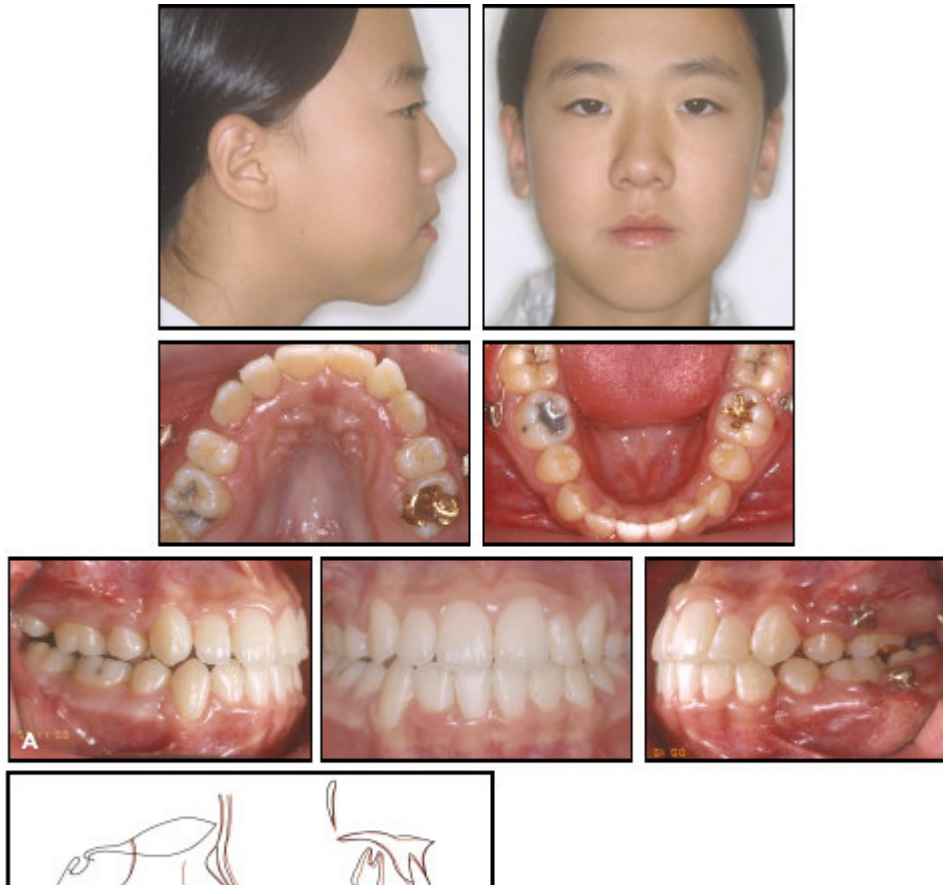

Fig. 7 A. Appliance removal after six months of treatment. B. Superimposition of pre- and post-treatment cephalometric tracings.

TABLES

TABLE 1
CEPHALOMETRIC SUMMARY

	Norm	Pretreat-ment	Post-Treatment
SNA	82.05°	78.5°	77.0°
SNB	79.79°	73.0°	73.5°
ANB	2.26°	5.5°	3.5°
FMA	23.50°	41.0°	40.0°
Ramus height	54.61mm	40mm	42mm

Table. 1

REFERENCES

1 Costa, A.; Raffaini, M.; and Melsen, B.: Miniscrews as orthodontic anchorage: A preliminary report, Int. J. Adult Orthod. Orthog. Surg. 13:201-209, 1998.

2 Gray, J.B.; Steen, M.E.; King, G.J.; and Clark, A.E.: Studies on the efficacy of implants as orthodontic anchorage, Am. J. Orthod. 83:311-317, 1983.

3 Mommaerts, M.: Horizontal anchorage in the ascending ramus: A technical note, Int. J. Adult Orthod. Orthog. Surg. 13:59-65, 1998.

4 Roberts, W.E.; Helm, F.R.; Marshall, K.J.; and Gongloff, R.K.: Rigid endosseous implants for orthodontic and orthopedic anchorage, Angle Orthod. 59:247-255, 1989.

5 Sherman, A.: Bone reaction to orthodontic forces on vitreous carbon dental implants, Am. J. Orthod. 74:79-87, 1978.

6 Block, M.S. and Hoffman, D.R.: A new device for absolute anchorage for orthodontics, Am. J. Orthod. 107:251-258, 1995.

7 Creekmore, T.D. and Eklund, M.K.: The possibility of skeletal anchorage, J. Clin. Orthod. 17:266-269, 1983.

8 Umemori, M.; Sugawara, J.; Mitani, H.; Nagasaka, H.; and Kawamura, H.: Skeletal anchorage system for open-bite correction, Am. J. Orthod. 115:166-174, 1998.

FOOTNOTES

1 Martin Medizin-Technik, Germany.