

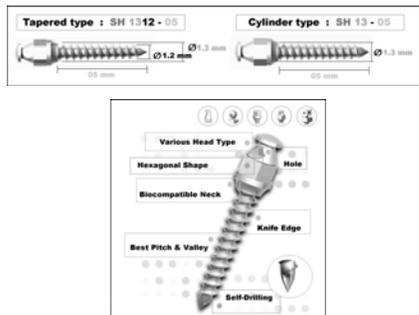
What type of mini-implants?

Osseointegrated
Non-osseointegrated

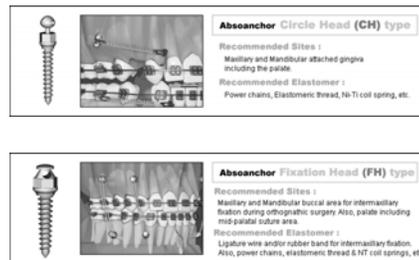
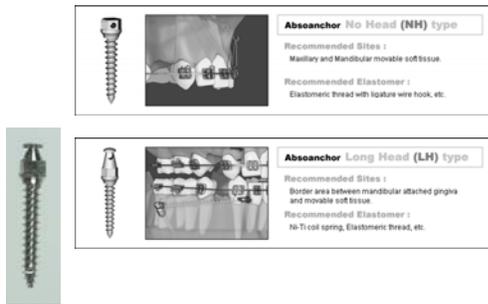
Non-osseointegrated

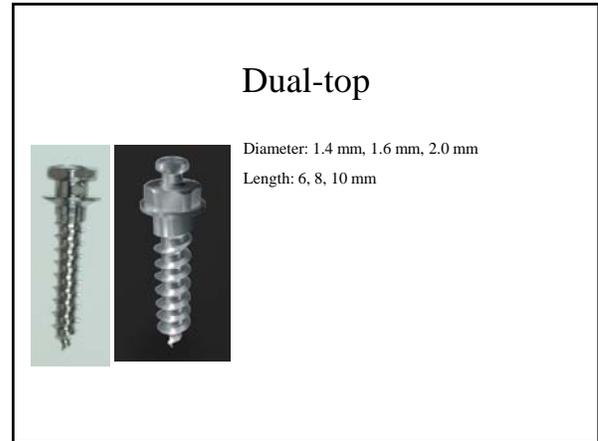
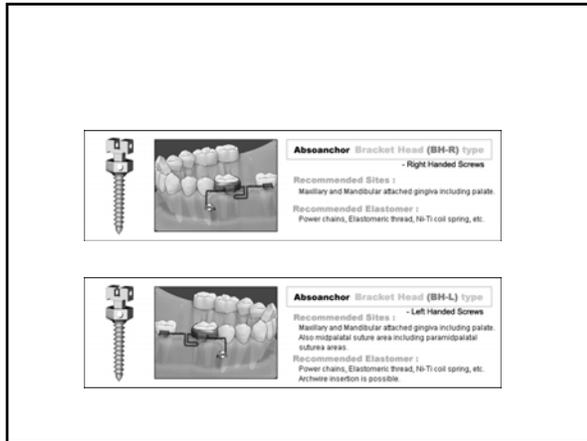
- Require a tight fit to be effective
- Stability depends on the quality and quantity of cortical and trabecular bone.

AbsoAnchor



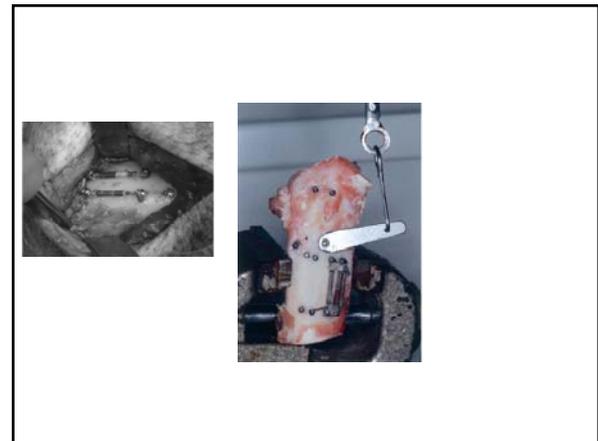
AbsorAnchor





AbsorAnchor vs. Dual-top

- 102 AbsorAnchor vs. 98 Dual-top on mini-pigs.
- Immediately loaded with tension coil 100, 300, 500 cN
- 3 different distance from bone rim to neck of implants : 1, 2, 3mm
– Buchter A. et al. Clinical oral implant restoration 2005; 16:473-9



Absor-anchor vs. Dual-top

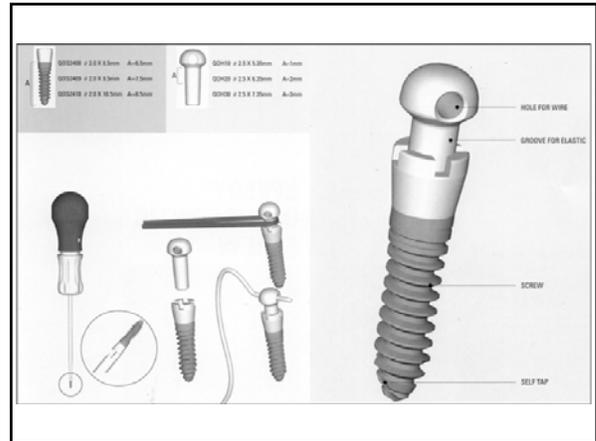
	Absoranchor	Dual top
Fracture during insertion	6	2
Fracture during removal torque test	1	1
Show implant bending and peri-implant bone loss during tension force test	4	1

Absor-anchor vs. Dual-top

- Removal torque: Dual top > absoranchor
- Implant failure is related to the tipping moment at the bone rim
- As long as the tipping moment is under 900 cN-mm, mini-implants can be loaded immediately

Osseointegrated

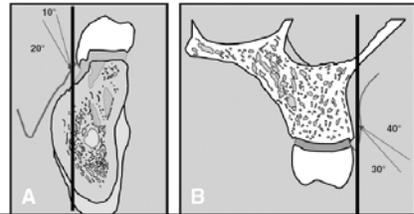
- C-Implant (Korea):
 - Diameter: 1.8mm,
 - Length: 8.5mm, 9.5mm, 10.5mm
 - Surface: sandblasted, large-grit, and acid-etched.
 - <http://cimplant.com/eng/product/main.asp>
 - The head measures 2.5mm in diameter and 5.35mm, 6.35mm, or 7.35mm in height. It contains a 0.8mm-diameter hole located 1mm, 2mm, or 3mm from the top of the screw



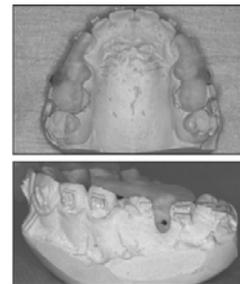
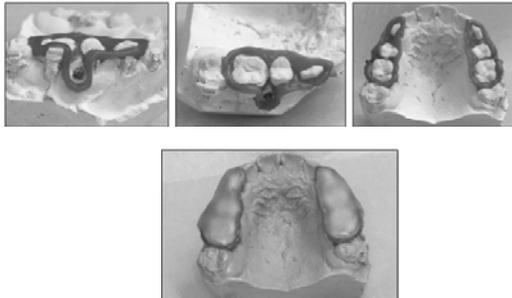
Surgical Guide

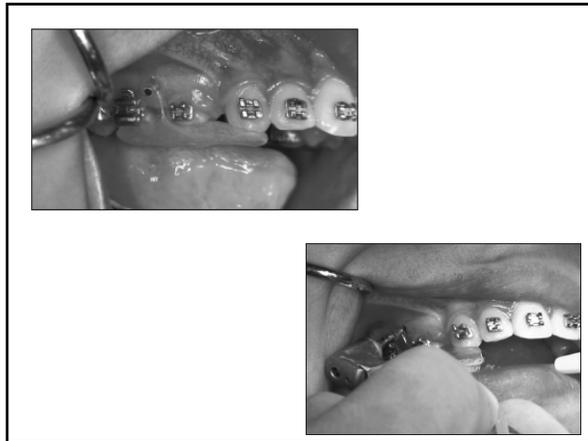
Implant Angle

- Recommended angles of the implant to the long axes of the teeth have ranged from 10-20° in the mandible and from 30-40° in the maxilla.

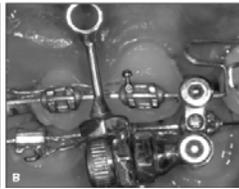


Surgical Guide



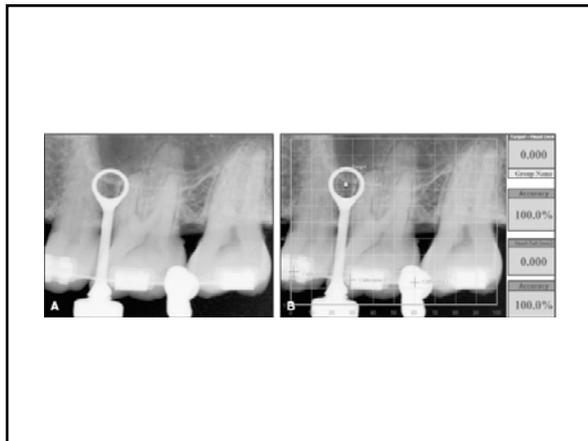
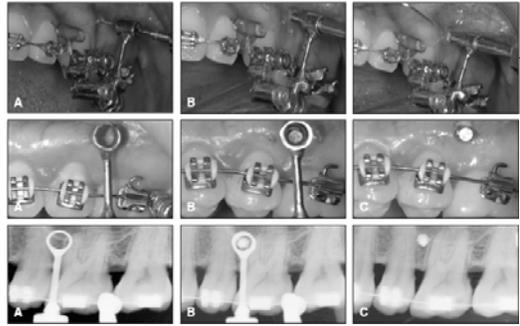


Surgical Guide

- Y&B Products, Thailand

– Suzuki EY, 2005

- A custom manual screwdriver fits exactly inside the stainless steel tube.

How much force?

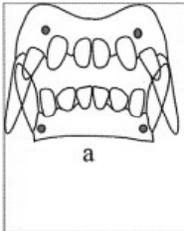
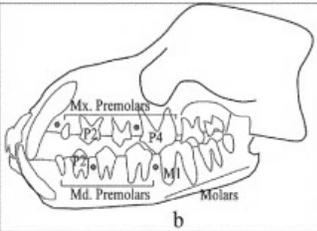
For placement of implant?
For withstand orthodontic force?

Implant placement torque (IPT)

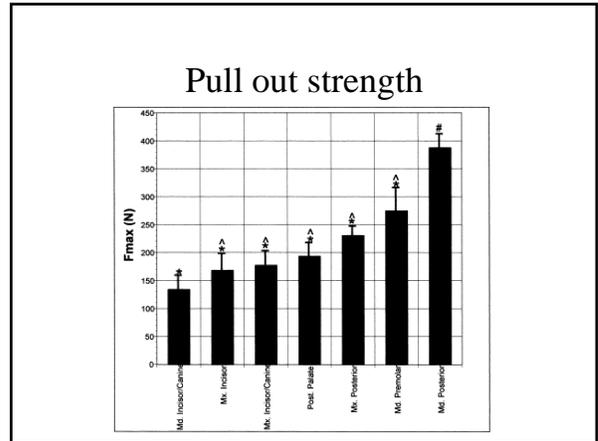
- The IPT in the mandible was significantly higher in the failure group than in the success group. Therefore, a large IPT should not be used always.
- The recommended IPT is within the range from 5-10 Ncm
 - Motoyoshi M, et al. Clin. Oral Impl. Res. 2006;17:109-14.



Pull-out strength

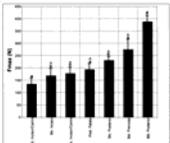
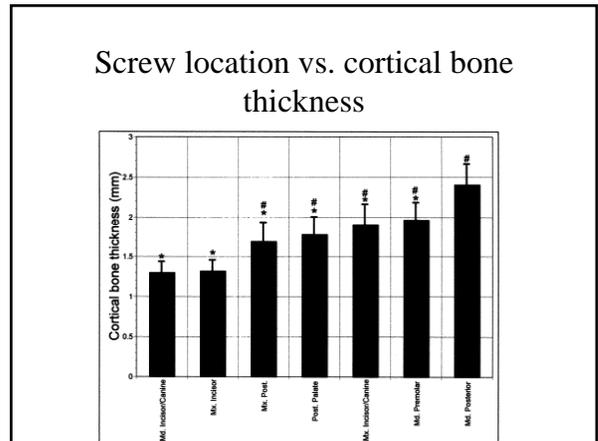



- Huja SS. Pull-out strength of monocortical screws placed in the maxillae and mandibles of dogs. AJODO 2005; 127 (3): 307-313.



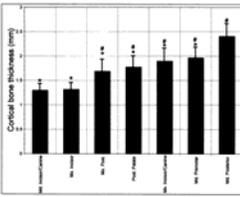
Pull out strength

- Fmax: anterior mandibular region ($134.5 \pm 24N$, mean \pm SE) < posterior mandibular region ($388.3 \pm 23.1N$).
- Normal orthodontic force: 0.3-4 N
- Greater pull-out strength in the posterior regions of the jaws

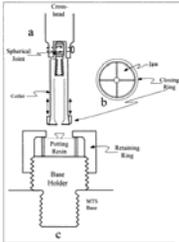



Cortical bone thickness

- Regression analyses suggested a weak ($r = 0.39$, $P = .02$) but significant correlation between Fmax and cortical bone thickness.
- Cortical bone thickness
 - Anterior region: 1.3mm
 - Posterior region: 2-2.4mm



Pull out strength



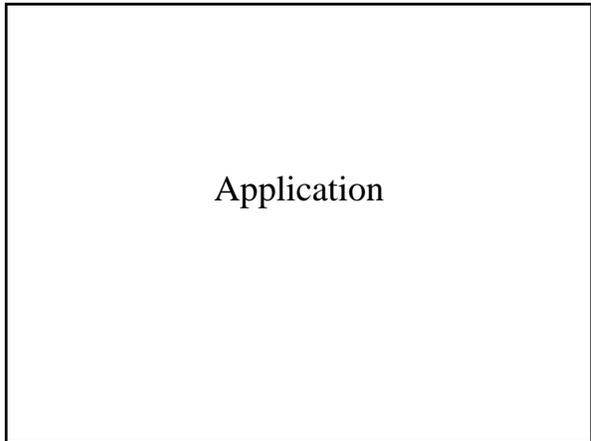
A recent study suggests that screws tested with the axial pull-out method have 34% higher pull-out force than the same screws tested with a tangential pull-out method



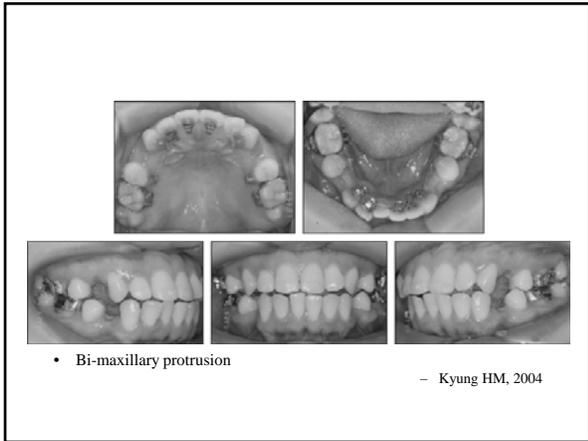


Retraction force

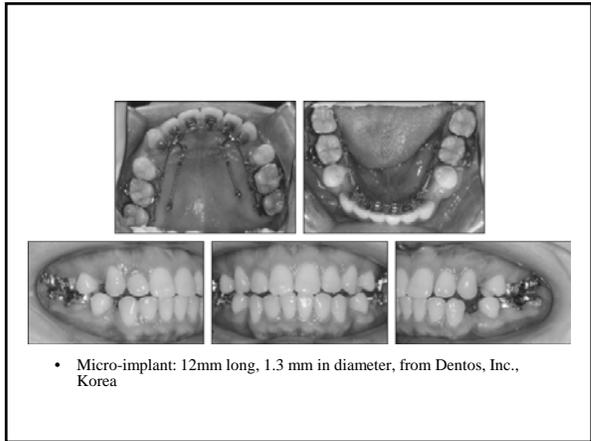
- Irreversible deformation of TPA occurred at 408.5cN.
 - Crismani AG, et al. Eu J Orthod 2005; 27:226-30.
- Force of 300-400 cN causes anchorage loss.
- Instability of the implant proved not to be the cause of the loss of anchorage. The mesial movement of the anchor teeth was rather caused by a slight deformation of the long arms of the transpalatal bars between the implant and the anchor teeth.
 - Wehrbein H et al. AJODO 1999; 116: 678-86.



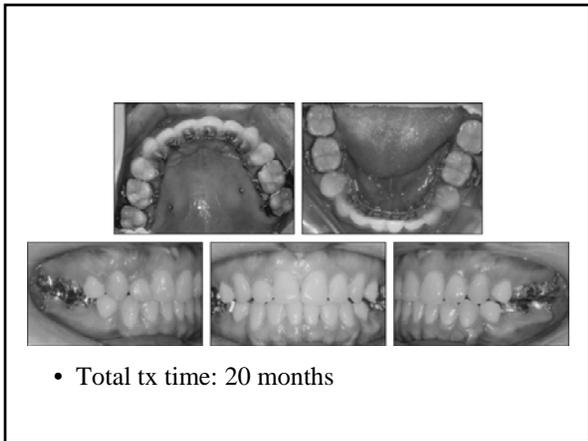
Application



- Bi-maxillary protrusion
 - Kyung HM, 2004



- Micro-implant: 12mm long, 1.3 mm in diameter, from Dentos, Inc., Korea

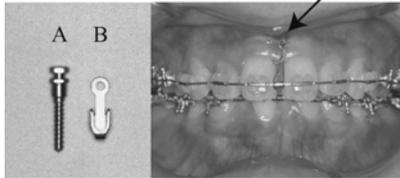


- Total tx time: 20 months



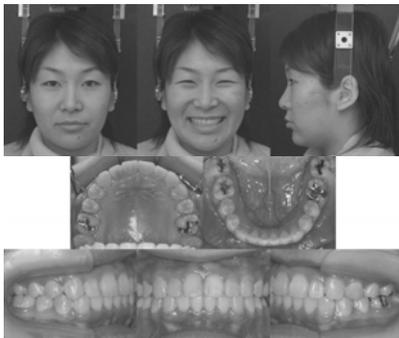
- Gummy smile, deep bite 7.2mm

Intrusion of upper incisors in deep bite case



- 1.2mm in diameter, 6 mm long
- Orthoanchor K1 system, Dentsply Sankin corp., Japan

- Mini-implant: 3mm above the root apex, between the roots
- Initial implant placement >> 6 months healing period >> abutment placement >> 2 months healing >> activate intrusion with 20 g for 15 months with ligature wire or elastic thread

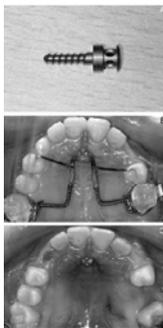


- Incisors were intruded 4 mm with 5⁰ lingual root torque.



- No incisor root resorption
- Ohnishi H, et al. Angle Orthod. 2005

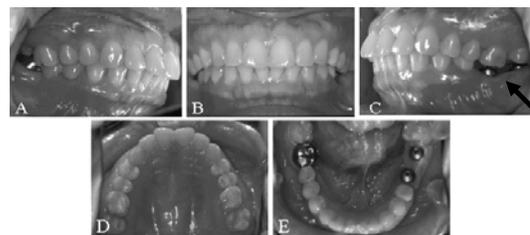
Unilateral distal molar movement with an implant-supported Distal Jet Appliance



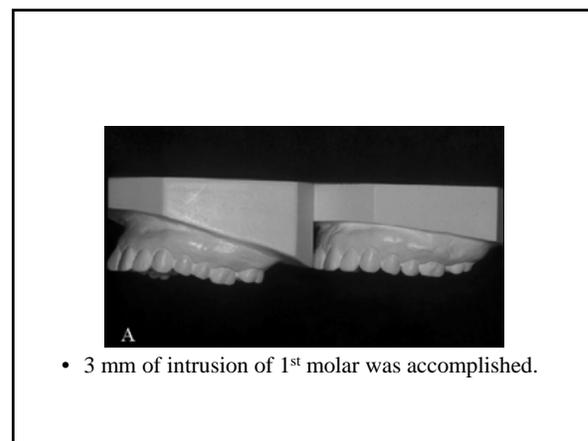
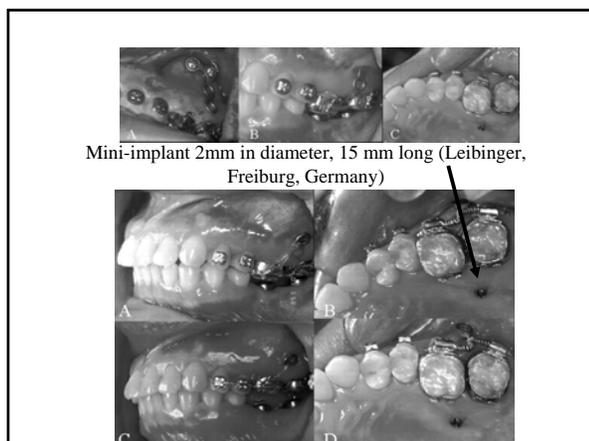
- Upper left 2nd premolar was impacted due to mesial drifting of 1st molar
- The joint between the implant and the appliance was secured with composite material.
- 8 mm of space was created within 4 months

• Karaman AI. 2002

Intrusion of molars



– Yao C.C., Angle orthodontist, 2004



En Masse retraction of whole arch in non-extraction case

- If the amount of distal movement of upper molars is less than 3mm, place the mini-implant on the buccal side between 5 and 6.
- If the amount of distal movement of upper molars is more than 3 mm, place the mini-implant on the palatal side between 6 and 7.

– Park HS, et al. Angle Orthod 2004;74: 539-49

En Masse retraction of whole arch in non-extraction case

- In the mandibular arch, place the mini-implant between 6 and 7, distobuccal side of 7 or retromolar area.

– Park HS, et al. Angle Orthod 2004;74: 539-49

- Taking micro-CT from 5 human maxillary bone specimens
- Horizontally sectioned images of the interalveolar septum area 2,4,6,8,10 and 12 mm deep from the alveolar crest
- Results: the safest location between upper 5 and 6 for mini-implant is 6-8 mm apical to alveolar crest from the palatal side.

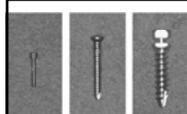
Complication

- The drill will stop or the patient will report pain if a root is contacted, and that the direction of drilling can then be adjusted until a satisfactory implant site is found.
 - Kyung HM, 2003; Somchai M, 2004
- The roots can be expected to recuperate completely even when severely damaged.
 - Kyung HM, 2003

- A sudden increase in resistance after penetration of the cortical bone indicates root contact, which means the angle of insertion must be changed to avoid damage.



- Because the retraction force is applied buccally, the molars will roll lingually and distally. Buccal crown torque and buccally flaring bend should be used to prevent this from happening.
 - Park HS, et al. Angle Orthod 2004;74: 539-49.



Success rate: diameter

- 1 year success rate: 1mm in diameter (0%, all failed) < 1.5 (83.9%) or 2.3mm (85%) in diameter
 - Miyawaki S. et al. AJODO 2003;124:373-8

Success rate: Location of implants

- Miyawaki 2003: max posterior = md posterior
- Cheng 2004: max posterior > md posterior
- Motoyoshi 2006: max posterior = md posterior

Success rate: brands of implants

- 70%: 8mm long, 1.6-2mm in diameter, Jeil Medical Corp. (South Korea)
 - Fritz, K. et al. J Orofac Orthop. 2004 Sep;65(5):410-8
- 74.2%: 6mm-long/1.6mm-diameter
 - early-loaded (81.3%) = the delayed-loaded (83.3%) OMI's.
 - The loaded-OMI success rate overall (82.4%) > the control-OMI (non-loaded) success rate (65.6%).
 - OMI's placed in the posterior mandible had the lowest success rate (66%) and as a trend, the more posteriorly placed in either arch, the lower the success rate. However, no statistically significant differences in success rates were found among these groups.
 - Garfinkle, JS. et al. IADR presentation

Success rate : brands of implants

- 50%: orthoanchor K1 mini-implants, delayed loaded for 7-15 weeks,
 - K1 fracture during implantation: 9.1%
 - K1 fracture during mastication: 2.3%
 - K1 loosening before and after force application were 22.7% and 16% respectively;
 - the failure rate on maxilla was higher than that on mandible (38.6% V.S. 11.4%),
 - the failure rate of implanted position on mucosa higher than that on attached gingival (47.7% V.S. 2.3%).
 - Cheng HC. et al. IADR presentation

Success rate: brands of implants

- 85.5%: ISA orthodontic implant, 1.6mm in diameter, 8mm long
 - Motoyoshi M, et al. Clin. Oral Impl. Res. 2006;17:109-14.

Success rate: Non-related factors

- Miyawaki 2003: screw length, kind of placement surgery (flap vs. no flap), immediate loading, age, gender, crowding of teeth, A-P jaw relationship, controlled periodontitis, TMD
- Motoyoshi 2006: age, gender

Success rate: self-drilling vs. self-tapping

- self-drilling group: (93%)
- self-tapping group (86%).
- Higher peak insertion torque and peak removal torque values were seen in the self-drilling group in both the maxilla and the mandible.
- A tendency to fracture was found in self-drilling group.
- The percentage of bone-to-implant contact values was greater in the self-drilling group.
 - Chen,Y et al. Am J Orthod Dentofacial Orthop. 2008 Jan;133(1):44-50.