

The Close Eruption Technique for Trans-alveolar Impacted Lower 1st Premolar



Chris Chang, DDS, Ph.D.
Director,
Beethoven Orthodontic Center

Introduction

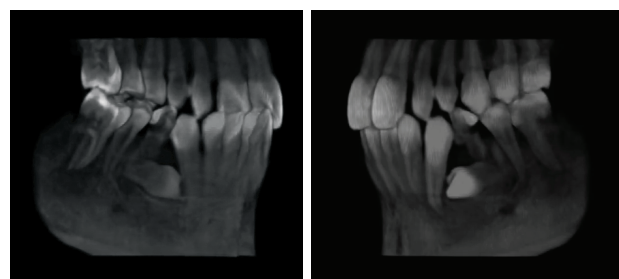
The close window technique is an ideal surgical option to treat trans-alveolar impacted premolar. This article aims to provide step-by-step illustrations on the surgical procedures that can improve safety, mechanics and healing of the wound so doctors can use them as a checklist before approaching this type of cases.

Case Study

A 13-year-11-month-old female came for consultation. The panorex film showed one trans-alveolar impacted lower 1st premolar and one deciduous 1st molar remaining on the left side (Fig. 1). CT scans indicate that the crown of the lower 1st premolar was impacted on the distal-buccal side of the canine and the root was impacted on the mesial-lingual side of the lower 2nd premolar (Fig. 2). The distance between the mental nerve and CEJ of the impacted lower 1st premolar is measured at 7mm. An appropriate surgical technique is then selected based on the provided information.¹ Illustrations of the impacted lower 1st premolar and the mental nerve mark the approximate position (Fig. 3). Detailed surgical procedures of this surgery are discussed at below.

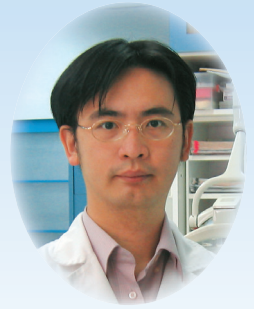


■ Fig 1. Pretreatment pano radiograph & intraoral photographs.



■ Fig. 2:

Pretreatment CT image. Frontal view and rear view reveal that the crown of impacted lower 1st premolar is impacted by middle site of the root of lower canine. And the distance between the mental nerve and the CEJ of the impacted lower 1st premolar is 7mm.



Dr. Hsi Yuan Lin, Lecturer,
Beethoven Orthodontic Course

Surgery Process

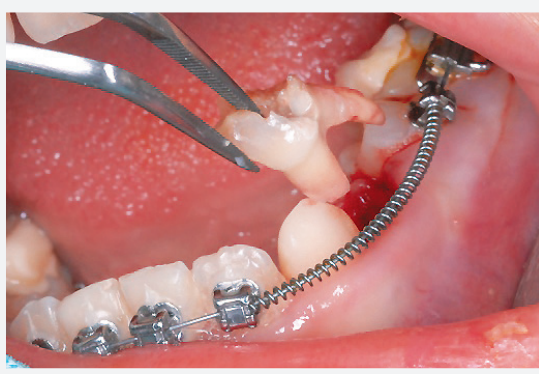
First, local anesthesia was applied in the surgical site and the deciduous 1st molar was extracted (Fig. 4).

Second, use a #12 blade to make an incision along the sulcus from the distal-buccal side of 2nd premolar to the mesial-buccal side of canine. Select a #15c blade to make a full thickness vertical incision from the mesial side of canine to the connective tissue area over the distal side of lateral incisor (Fig. 5). The design of the vertical incision offered a good vision to the surgical field, allowed for more blood supply to the flap, and decreased the chance of damage to the mental nerve.^{2,3} It is important to inform patients about temporary loss of feeling over the mental area in advance.

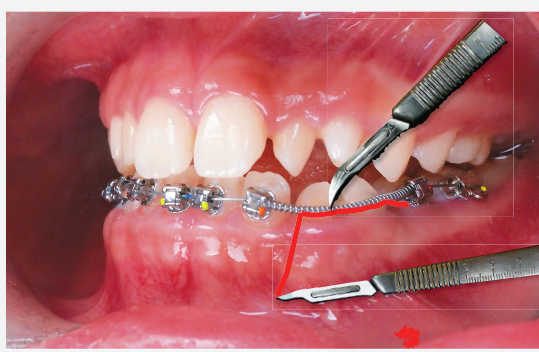
Third, use a periosteum elevator to raise the flap to have full visual access to the crown of impacted tooth and an explorer in an up-down motion to measure the thickness of covering bone and the margin between the tooth and the bone (Fig. 6).



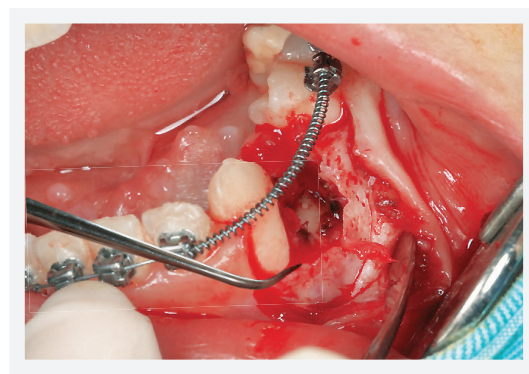
■ Fig. 3:
Illustrations of the impacted lower 1st premolar and the mental nerve mark the approximate position.



■ Fig. 4:
After applying local anesthesia, extract the deciduous 1st molar.



■ Fig. 5:
Use #12 and #15c blades to make sulcular & vertical incisions respectively.



■ Fig. 6:
Use a periosteum elevator to raise the flap and an explorer to detect the thickness and the margin of the covering bone.

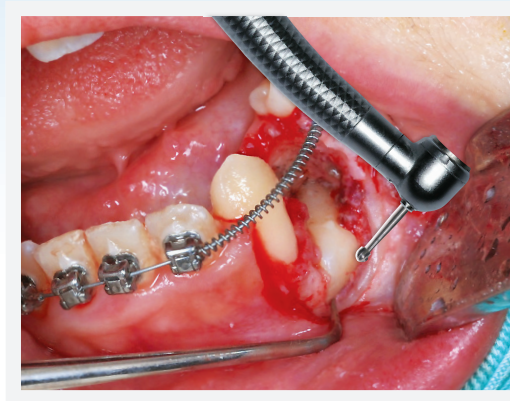
Although the CT image can provide much diagnostic information on the location of the impacted lower 1st premolar, using an explorer for detection is more effective. When an explorer touches teeth, one will feel it is in contact with a smooth surface whereas when contacting bone, one will feel a rough surface.

Fourth, a high speed handpiece and a carbide round bur were used to remove the covering bone carefully to avoid tooth damage (Fig. 7). All the removed bone will regenerate because the controlled orthodontic extrusion will induce new bone formation from PDL.

Fifth, put a button and connect it with a section of power chain (*the clear and gray color are strongly recommended*). After etching and bonding agent were applied, bond the button with a power chain onto the crown portion of the impacted tooth, and grab the power chain inside the archwire (Fig. 8). It is important to make sure that the surface of the button-power chain connection was covered by flowable resin to avoid loosening.

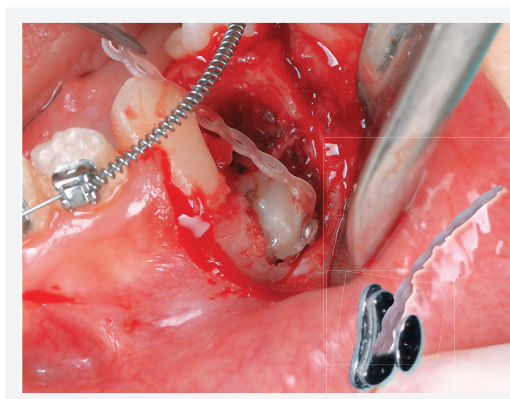
Sixth, suture the vertical incision of the flap with 6-0 Nylon by direct loop interrupted suture method with 6mm ears for minimal tissue trauma (Fig. 9).

Seventh, use an explorer to punch a hole reaching the cortical bone to make an indentation for a miniscrew (*OrthoBoneScrew, 2x12mm stainless steel with holes, Newton's A, Inc.*) on the buccal shelf of the permanent 1st molar.^{4,5} The position of the hole is better to be located over the keratinized tissue to avoid inflammation. Insert the miniscrew into the cortical bone on the buccal shelf of permanent 1st molar over the keratinized tissue (Fig. 10).

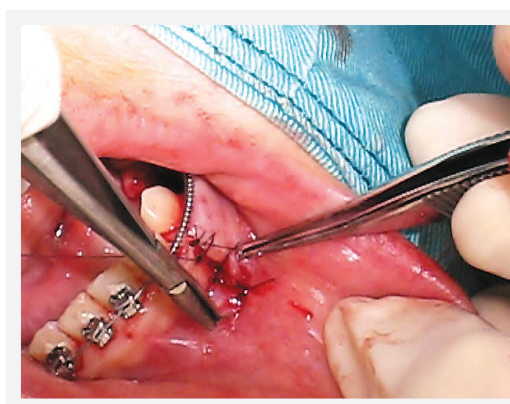


■ Fig. 7:

Remove the covering bone with a high speed handpiece and a carbide round bur.



■ Fig. 8: Bond a button with a power chain.



■ Fig. 9:

Suture the vertical incision with 6-0 Nylon for minimal tissue trauma.

Eighth, fabricate a double joints lever arm with a 19x25 stainless steel wire by bird beak plier (Fig. 11). Put the lever arm into the hole of the miniscrew and make sure the tail have been bended. It is essential to ensure the force design allow the impacted 1st premolar to be pulled out occlusally and slightly buccally (Fig. 12).⁶

Ninth, push the lever arm downward and pass through the power chain to activate the double joints lever arm (Fig. 13). Adding some flowable resin onto the junction of the lever arm and the power chain will decrease the chance of separation.

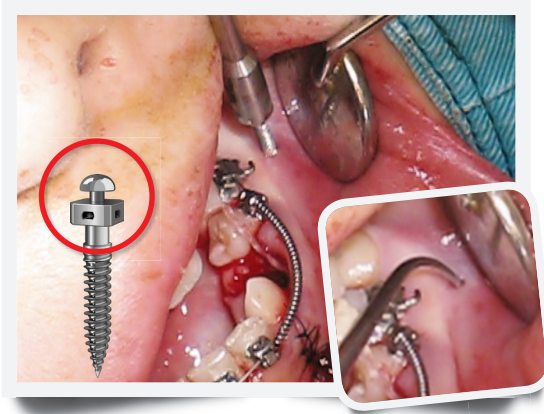


Fig. 10:
Use an explorer to make an indentation and insert a miniscrew on the buccal shelf.

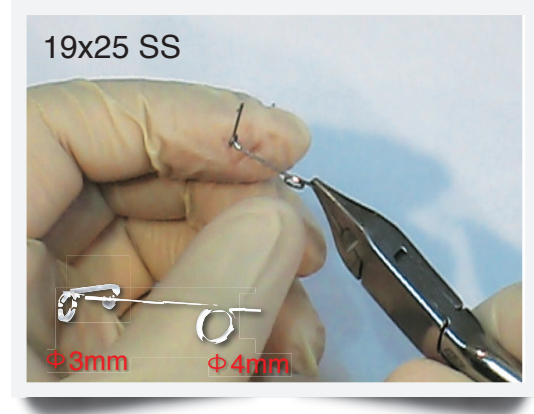


Fig. 11:
Fabricate the double joints lever arm by a bird beak plier.

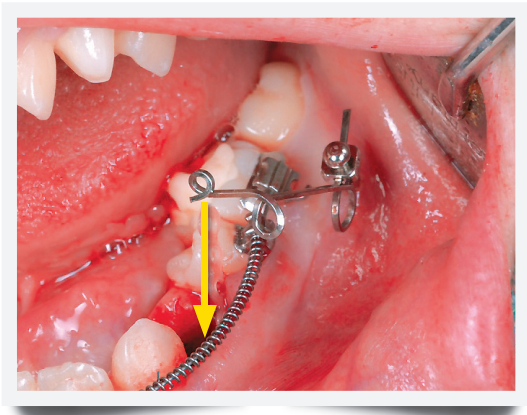


Fig. 12:
Put the level arm into the holes on the neck of the screw and test out the force mechanism.

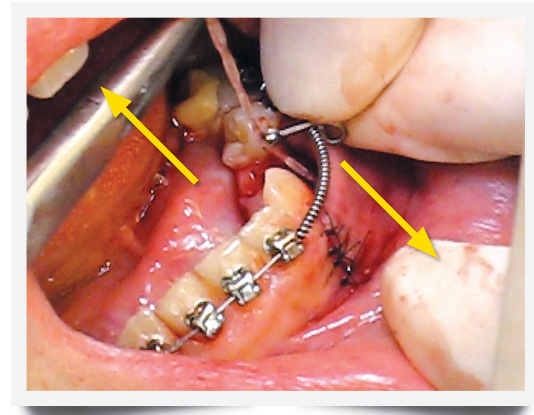


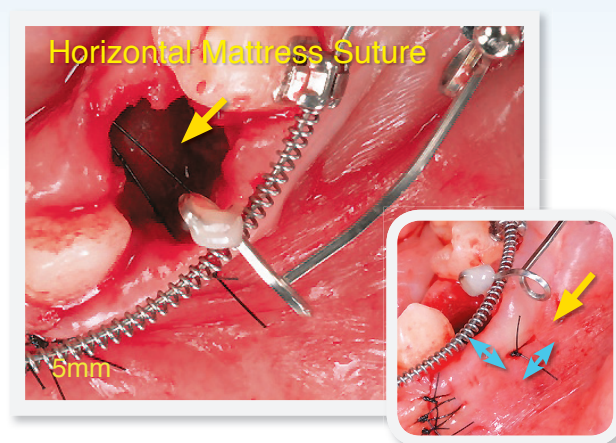
Fig. 13:
Push the level arm downward, and activate the double joints level arm by passing through the power chain.

Tenth, ligate the buccal and lingual flaps together with 5-0 Nylon by the horizontal mattress suture to stabilize the wound (Fig. 14).

Eleventh, perform a coronally repositioned flap with 6-0 Nylon to prevent gingival recession and minimize tissue trauma (Fig. 15).⁷ After etching and bonding the buccal surface of canine, pull the buccal flap upward with 6-0 Nylon by horizontal mattress suture, and the amount of flap to be pulled is about 2mm. Then affix the stitch on the canine with flowable resin. It is important to secure the reverse tail with flowable resin again to increase retention of suture. Keep the suture for at least three weeks for better healing.

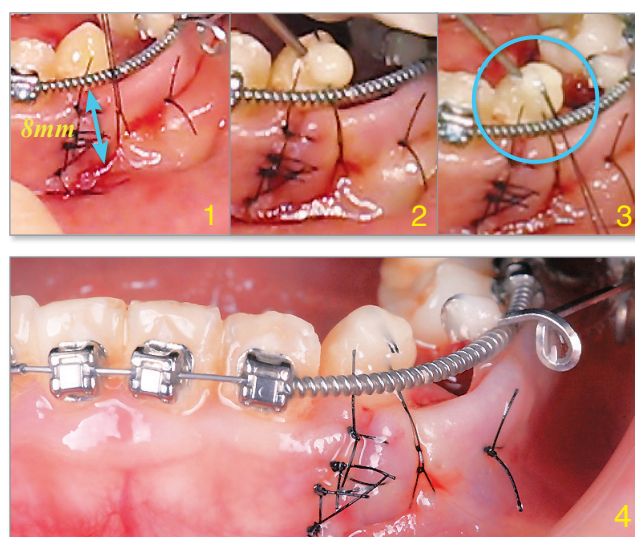
Twelfth, press the flap with a gauze soaked in normal saline solution for 10 minutes to prevent dead space and decrease wound swelling and inflammation (Fig. 16).

Thirteenth, COE-PAK was used to cover the wound, and wet gauzes laid on top of COE-PAK to make it touching the wound closely while pressing blood out. COE-PAK packed into the interdental space should be caught between the undercut. Spreading some vaseline on the gloves as a coating to make COE-PAK stick proof. COE-PAK can help stop bleeding and cover the wound for patient's comfort. It will delay soft tissue healing and avoid the soft tissue covering the wound for the epithelium averagely grows at the rate of 1 mm per day. Remove COE-PAK three days after the surgery and monitor the emergence of the impaction in three weeks (Fig. 17)⁸⁻¹⁰.



■ Fig. 14:

Use the horizontal mattress suture to hold the buccal and lingual flaps with 5-0 Nylon.



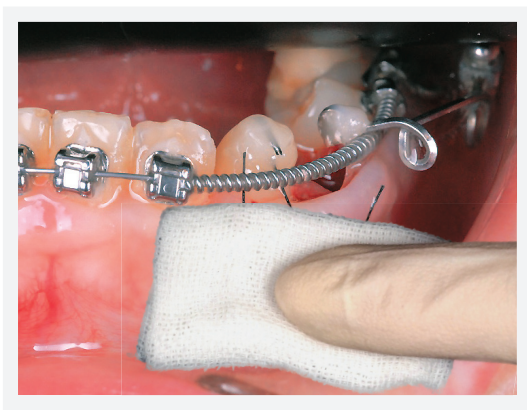
■ Fig. 15:

Use coronally repositioned flap with 6-0 Nylon to prevent gingival recession.

Discussion

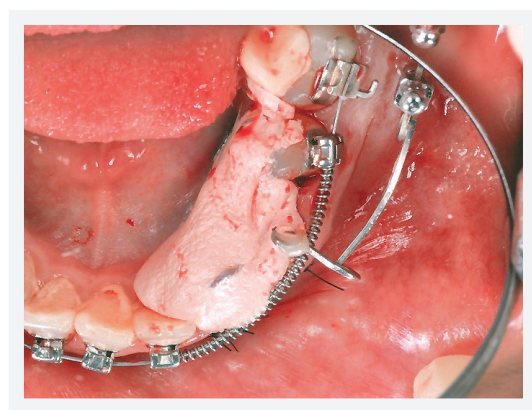
According to the procedures of the operation, ten key tips are summarized below for treating impacted lower 1st premolar (Fig. 18).

1. Assess the 3D imaging with CBCT to determine the precise location of impactions and the surrounding nerves.
2. Do not bond adjacent teeth to prevent root resorption.
3. Design the incision lines to avoid mental nerve damage.
4. Isolate the margin between the impaction and the bone with an explorer.
5. Trim the bone covering the impaction adequately to facilitate the movement of the impacted tooth.
6. Create a stable force mechanism by bonding a button attached with a power chain on the surface of the impacted tooth.
7. Use a miniscrew (*OrthoBoneScrew, 2x12mm stainless steel with holes, Newton's A, Inc.*) and insert a double joints lever arm bended with 19x25 stainless steel to form the force mechanism.
8. Use the direct loop interrupted suture, horizontal mattress suture and reposition the flap coronally to prevent soft tissue rupture, recession and scar formation.
9. Cover the wound with COE-PAK to stop bleeding, enhance patient comfort, and prevent soft tissue covering the wound due to rapid epithelization.
10. Press the flap with a gauze soaked in normal saline solution for 10 minutes to prevent dead space and decrease wound swelling and inflammation.



■ Fig. 16:

Press the flap with a gauze soaked in saline solution for 10 min to prevent dead space.



■ Fig. 17:

Cover the wound with COE-PAK and pack it into the interdental space so it will be caught between the undercut.

All of the procedures focus on three key points throughout the treatment: safety, force design and healing (Fig. 19).

Safety: The risk of treatment depends on the depth of impaction and condition of surrounding tissue (Key1-3). Accurate assessment of location and appropriate surgical treatment can minimize risks of complications.

Force design: The proposed force system can provide an additional force system independent from the main archwire and be activated repeatedly and steadily (Key 4-7).

Healing: Post operation wound treatment can improve the result and minimize trauma for patients (Key 8-10).

Conclusion

In this article a simplified method is proposed and step-by-step illustrations on the surgical procedures is provided so doctors can use them as a guideline when approaching this type of cases.

References

1. Kokich VG. Surgical and orthodontic management of impacted maxillary canine. *Am J Orthod Dentofacial Orthop* 2004;126:278-83
2. Su B., Hsu YL, Chang CH, Roberts WE. Soft Tissue Considerations for the Management of Impactions. *International Journal of Orthodontics & Implantology*. 2011;24:50-59
3. Su CW, Hsu YL, Chang CH. 阻生齒的軟組織處理面面觀. *News & Trends in Orthodontics*. 2011;22:54-59
4. Hsu YL, Chang CH, Roberts WE. OrthoBoneScrew. The dream screw for next generation's orthodontists. *International Journal of Orthodontics & Implantology*. 2011;23:34-49
5. Hsu YL, Chang CH, Roberts WE. OrthoBoneScrew. The dream screw for next generation's orthodontists. *News & Trends in Orthodontics*. 2011;22:34-51
6. Chang C. Advanced Damon Course, Beethoven Podcast Encyclopedia in Orthodontics 2012, Newton's A Ltd, Taiwan.
7. Chang C. VISTA Workshop Course, Beethoven Podcast Encyclopedia in Orthodontics 2011, Newton's A Ltd, Taiwan.
8. Yeh HY, Chang C, Roberts WE. Step-by-Step on the Open-Window Technique for Upper Palatal Impaction. *International Journal of Orthodontics & Implantology*. 2011;24:40-43
9. Cheng J, Chang CH. Simplified Open-Window Technique for Palatally Impacted Cuspid. *International Journal of Orthodontics & Implantology*. 2011;25:48-52
10. Chang C, Roberts WE. *Orthodontics*, 3D iBooks Ortho., Taiwan: Newton's A Ltd, 2012.

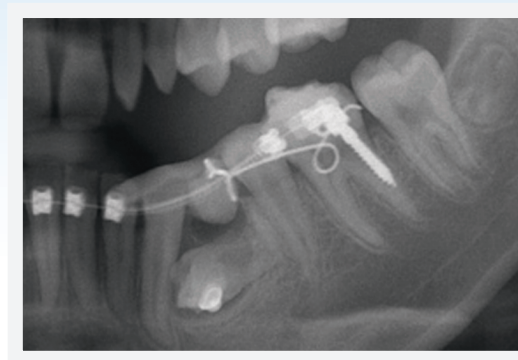


Fig. 18:
Check the final result of the operation on the panorex film.

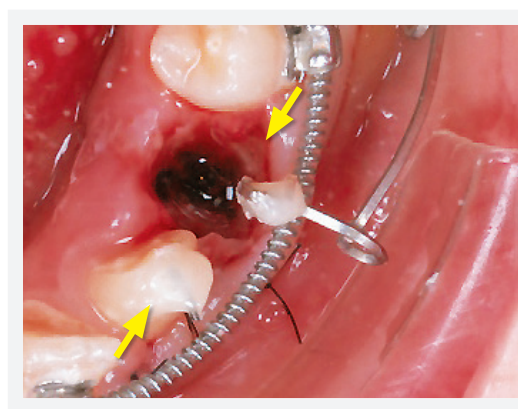


Fig. 19:
The direction of the force system is the key to make the impaction erupt. The horizontal mattress suture and the coronally repositioned flap can improve the outcome of soft tissues.