

ERUPTION OF IMPACTED MAXILLARY CUSPID

by Dr. Brock Rondeau

Introduction

The maxillary cuspid is usually the last tooth to erupt into the arch mesial to the first molars and, except for the third molars, is the most common tooth that is impacted. Because of the importance of the cuspid both from an esthetic, as well as an occlusal standpoint, it behooves the orthodontic practitioner to develop a system for erupting the impacted cuspid into its normal position in the dental arch. If you follow the system as outlined, your success rate for this difficult orthodontic procedure will be increased.

Summary of Steps in Eruption of Cuspids

1. Reasons cuspid becomes impacted
2. Determine position of impacted cuspid
 - a) Horizontal or vertical
 - b) Buccal or lingual
3. Informed Consent
4. Level, align, rotate erupted teeth
5. Create space for cuspid
6. Prepare anchorage
7. Attach ligature tie to lingual button
8. Surgical procedure
9. Check for ankylosis
10. Bonding procedure
11.
 - a) Suturing shallow impactions
 - b) Suturing deep impactions
12. Eruptive procedure

Reason for Treatment

It is important to try to bring the maxillary cuspids into the arch for the following reasons; proper occlusion, cosmetic reasons, to prevent resorption of the roots of the adjacent teeth, (particularly the lateral incisors), prevention of referred pain, infections, and cyst formation.

Complete Records

A complete set of orthodontic records must be taken for diagnostic purposes including medical-dental histories, panoramic radiographs, cephalometric radiograph, occlusal and periapical radiographs, study models, recording all clinical findings including TMJ examination and notation of all signs and symptoms including muscle palpation.

Step #1—Reasons Cuspids Become Impacted

Prior to the orthodontic-surgical procedure the cause of the impaction must be determined.

As mentioned previously, the maxillary cuspid is the most commonly impacted tooth except for the third molars. This is partly due to the long period of development, the great distance they must travel for eruption, and the fact that the eruption depends on various environmental factors. This would include such things as airway problems which could lead to mouthbreathing, poor tongue position and a constricted maxillary arch. One of the main reasons for the impaction of the cuspid is due to a shortage of arch length which causes the cuspid to be deflected either buccally or lingually during its eruptive pattern.

Reasons cuspids may not erupt include trauma to the deciduous cuspid, retained primary tooth, supernumary tooth, cyst formation, ameloblastoma, scar tissue, ankylosis, constricted maxillary arch, lack of adequate arch length, tooth size discrepancy, abnormal eruption direction.

The clinician must determine whether the cuspid has a soft tissue or osseous barrier impeding its eruption. Frequently, however, in the case of impacted cuspids, the mere removal of the soft and hard tissues overlying the impacted tooth will not be enough to remedy the situation and orthodontic treatment will have to be instituted.

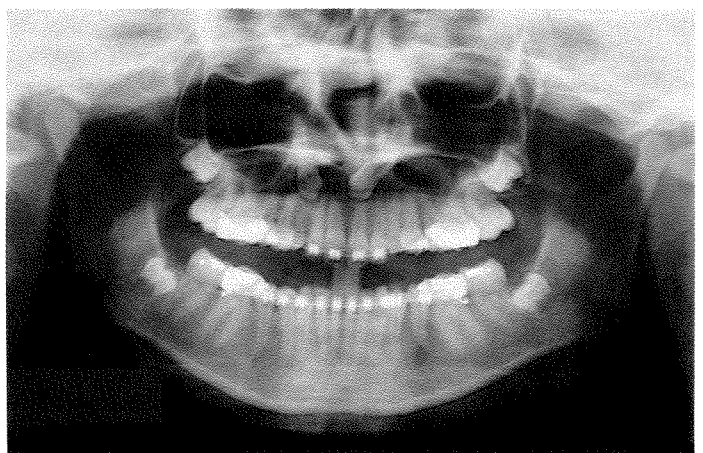
Step #2—Determination of Position of Impacted Cuspid

- a) Horizontal or Vertical
- b) Buccal or Lingual (Palatal)

a) Horizontal or Vertical

One of the main factors in the success of the eruption of the impacted cuspid is the relative position of the cuspid either horizontal or vertical. If the cuspid is located vertically, and particularly if the roots are in good position, this is ideal and the prognosis is much improved. However, if the tooth is impacted horizontally, then there is a danger that you might damage the roots of the adjacent teeth (particularly the lateral incisors) when you attempt to upright and erupt this tooth. In particular, you must check the roots of the central and lateral incisors in relation to the cuspids. If the cuspid is horizontally impacted and you will be endangering the roots of the lateral incisor during the eruptive procedure, the best treatment might be to extract the cuspid. Other alternatives include attempting to erupt the cuspid, with possible resorption of the root of the lateral incisor which could result in the loss of the incisor tooth or need for root canal therapy.

Figure 1



3 Eruptive Vertical

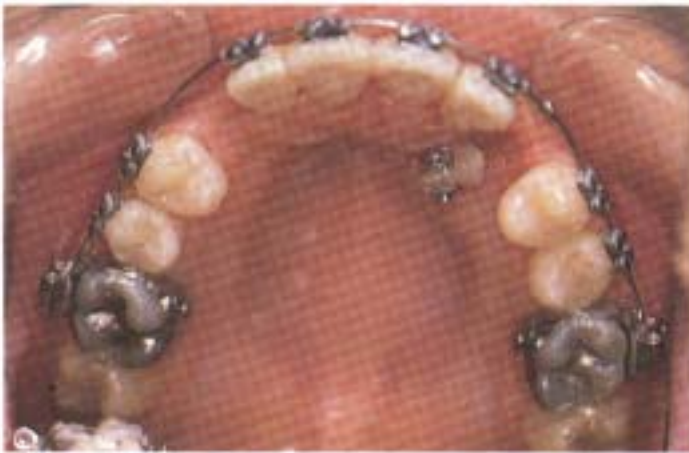
3 Slightly horizontal concern about damage to the roots of LL 2

b) Buccal or lingual

Prior to the surgical procedure the exact location of the impacted cuspid on the buccal or the lingual must be determined. Three methods of localization are: 1) inspection 2) palpation 3) radiographs.

- 1) Inspection—Check for the bulge of the unerupted tooth to see if it is on the buccal or the lingual. Check the lateral incisor nearest the impacted cuspid. The position of the lateral incisor is influenced by impacted cuspids far more than the first bicusps because the crowns of most cuspids are angulated mesially. One clinical sign would be the crown of a lateral incisor moving lingually while the root is pushed labially by a palatally impacted cuspid.
- 2) Palpation—Usually a properly erupting cuspid can be palpated by nine years of age. The clinician can manipulate the deciduous cuspid to determine if it is mobile. If it is, then this indicates that its root has resorbed and that the permanent cuspid is erupting in the desired location. It is estimated that 70 percent of the time an impacted cuspid can be palpated.
- 3) Radiographs—In 30 percent of the cases radiographs must be utilized to determine the position of the impacted cuspid. Periapical and occlusal radiographs must be used to determine if the cuspid is buccal or lingual.

Figure 2



Lingual Impaction

Buccal Impaction

Buccal impactions have a higher incidence of ankylosis. In all cases after the surgical exposure of the buccal impaction, the clinician must check to see if the tooth is ankylosed. If ankylosed, the treatment of choice is usually extraction.

Lingual Impaction

Lingually impacted cuspids have a more favorable prognosis than labially impacted cuspids. Cuspids on the lingual are protected from trauma, are less frequently ankylosed, take less time to retrieve, have better gingival integrity, and have less tendency to relapse (elevate), following the treatment. Therefore following the surgical procedure and prior to the orthodontic bonding procedure, always check particularly the buccally impacted cuspids for the possibility of ankylosis.

One of the risks of lingually impacted maxillary cuspids is resorption of the roots of the lateral incisors. The risk of root resorption appears to be much less with buccally impacted cuspids. Hitchin (1956) reported that 5 out of 109 cases of

impacted cuspids resulted in root resorption of the lateral incisors. Howard (1971) reported that 7 patients out of 52 demonstrated root resorption of the laterals. Therefore it is important to check this radiographically prior to and during the eruptive procedure, as well as to keep the patient fully informed as to the risks involved. If the radiographs indicate that the roots of the lateral incisor has been severely resorbed, then it may have to be extracted.

Figure 3



*Root Resorption
Lateral Incisor*

Once you have determined whether the tooth is buccal or lingual, you must anticipate how far it is necessary to move the crown and the root of the impacted tooth to the ideal position. Let us suppose we have 3 examples where the cuspid is impacted lingually.

Figure 4



*Root Resorption
Central and
Lateral Incisor*

1. In the case of the crown and the root located vertically, the prognosis for this case would be excellent.
2. When the tooth is horizontally impacted with the crown located close to the ideal and the root located lingually, this is a very difficult case. This could result in root resorption in attempting to move the root so far through the bone. In this case the cuspid may have to be extracted.
3. If the tooth is slightly horizontally impacted with the root located close to the ideal and the crown located lin-

gually, the prognosis is better than the previous case. Surgically a channel of alveolar bone could be removed around the crown and the tooth moved towards the archwire orthodontically.

Step #3—Informed Consent

Prior to the initiation of any clinical procedure, it is imperative that the entire procedure be thoroughly explained to the patient at the informed consent treatment conference. This informed consent agreement is a necessary legal document for any orthodontic treatment and especially in complex cases such as the eruption of impacted cuspids. The patient must be thoroughly informed as to the risks involved particularly the possibility of root resorption and ankylosis. Either of these two problems could occur any time either prior to or during the eruptive procedure. Legally and morally the patient must be informed as to the advantages as well as the risks and the disadvantages of this procedure prior to treatment. This informed consent treatment conference will help establish an open and honest relationship between the doctor and patient which will be very necessary for these types of difficult procedures. Patients have a tendency to trust you more when you tell them everything including the negative. The patient must be informed that due to the difficulty of the surgical orthodontic procedure, more time (approximately 9-12 months), as well as additional cost will be involved. At no time can any implied, verbal, or written guarantee of successful treatment be given to the patient. After all the risks have been thoroughly explained, the patient has the option to consent to treatment. The clinician must also carefully evaluate the attitude of the patient during this consultation appointment. I would recommend proceeding with treatment only if the attitude was excellent. If the patient consents to the treatment plan, then an informed consent agreement which thoroughly explains all the risks previously discussed including ankylosis, root resorption, surgical complications, etc. must be signed prior to the initiation of any surgical-orthodontic treatment.

Step #4—Level, Align, Rotate Erupted Teeth

Orthodontic treatment is started with the placement of brackets on all erupted teeth and they are properly levelled, aligned, and rotations eliminated. Archwires that can be used to accomplish these objectives include:

- a) .0175 Respond Archwires (ORMCO)
- b) .018 NiTi Archwire Nickel Titanium (ORMCO)

Step #5—Create Adequate Space for Impacted Cuspid

There must be adequate space for the impacted cuspid to be able to erupt into the arch. If the maxillary arch is constricted, this problem must be solved immediately to help make room for the cuspid to erupt. If the maxilla is underdeveloped, then not only does it affect the eruption of the cuspid, but it also restricts the growth of the mandible. This frequently results in the condyles going posteriorly which can often lead to TMJ problems. If the maxillary arch is constricted in a transverse direction, indicating an arch width problem, expansion with either a slow removable palatal expander, i.e., Schwarz Plate or a rapid fixed palatal expander, i.e., Bonded Hyrax would be necessary. If the problem is antero-posterior (arch length problem), the utilization of an Anterior Sagittal or Posterior Sagittal may be the treatment of choice. The principle that must be adhered to is that you cannot attempt to erupt the cuspid before you have created adequate space. Sometimes

if the cuspid is positioned correctly (vertically), the mere development of the maxillary arch to its proper potential will ensure that the tooth can erupt normally with no further development.

Summary of Appliances:

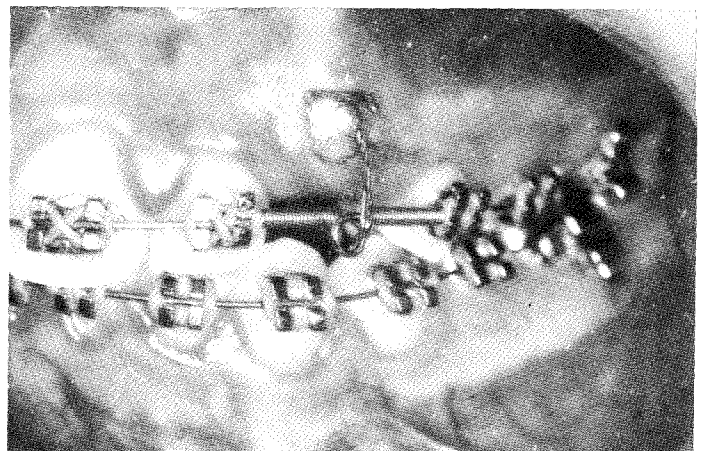
- a) *Transverse problems—Maxillary Expansion Appliances*
 1. Slow palatal expander—Schwarz Plate with occlusal PADS
 2. Rapid palatal expander—Bonded Hyrax
- b) *Antero-posterior problems*
 1. Anterior Sagittal
 2. Posterior Sagittal
 3. Cetlin
- c) *Fixed Mechanics*

.018 TMA archwire with open coils
Titanium Molybdenum Alloy (ORMCO)
Space is created for the cuspid with open coil.
Always create 2 mm. more space than you need.

Step #6—Prepare Anchorage

Prior to the surgical procedure it is important to properly align the brackets of the erupted teeth which will be used as anchor teeth in the eruption of the impacted cuspid. Proper anchorage means that you must use an archwire that has sufficient stiffness in order to resist the pull of the impacted teeth. If you do not have sufficient anchorage when eruptive forces are applied, the anchor teeth will move towards the cuspid, instead of the cuspid moving towards the anchor teeth. The object of the exercise is to allow the cuspid to erupt with little or no change to the other teeth (anchor teeth) in the arch. If an archwire with insufficient stiffness is used, this could result in excessive forces being applied to the anchor teeth, with possible root resorption. The .020 stainless steel round archwire is ideal because according to the wire stiffness chart (Burstone), it has a wire stiffness of approximately 630. Another advantage of the .020 stainless steel archwire is the ability to place a helix loop anywhere in the archwire, which enables the clinician to allow the teeth to erupt in any desirable direction.

Figure 5



.020 S.S. Helix Loop
Open Coil

.012 S.S. Ligature Tie
Lingual Button
to Helix Loop

Step #7—Attach Ligature Tie to the Bracket or Lingual Button

Prior to the surgical procedure, it is important to attach the ligature tie to the bracket or lingual button that will be bonded to the impacted cuspid. When this is done in advance, the advantages are as follows:

- a) It is much easier to attach the ligature wire ahead of time rather than attempt to attach it to a newly bonded bracket or button. Since it takes 24 hours for the bond to reach its maximum strength, it is important not to place any more force on the bracket or button than is necessary, or this may result in the bracket or button coming off prematurely.
- b) The ligature tie attached to the bracket or button acts like a handle which allows you to more accurately place the bracket or button on the tooth during the bonding procedure.
- c) Since the ligature tie and the bracket or button are placed under the tissue, it is advisable to pre-sterilize them prior to the surgical procedure to minimize the risks of secondary infection.

It is possible to either use a bracket or a lingual button for attaching the ligature tie. The selection will depend mainly on two factors: 1) What is the shape of the tooth surface that is exposed? and 2) How much of the tooth is exposed? If only a small part of the tooth is exposed, frequently you can only place a lingual button. Later on as the tooth continues to erupt, a bracket could be placed.

Brackets or buttons are preferable to using threaded pins. These pins go at least 2 mm. into the enamel surface and following the eruptive procedure must be removed and a suitable restoration placed. The bracket or button only invades the enamel surface 25 microns and at the end of the procedure there is no permanent damage done to the enamel.

The ligature tie of choice would be .012 stainless steel. This is considerably stronger than the .010 stainless steel ligature tie which is routinely used for most bracket ligature procedures. The problem with using .010 stainless steel is that it may become strain hardened during the orthodontic treatment and fracture. This will be a particularly serious problem if it is a deep impaction, thereby necessitating a second surgical procedure. Therefore it is advisable to use the stronger .012 ligature tie.

Step #8—Surgical Procedure

Remember to create adequate space for the cuspid and to prepare your anchorage prior to the surgical procedure. Teeth must be completely aligned with the .020 stainless steel wire with a helix loop placed in the maxillary arch.

During the surgical procedure try to control the bleeding since you want to bond a bracket or lingual button onto the impacted cuspid at the same appointment. The use of xylocaine with 1/50,000 epinephrine, which is a long acting local anesthetic, will aid in hemostasis during the surgical procedure. If the primary cuspid is present it should be extracted.

Using a #15C scalpel blade, make a semilunar incision, starting mesio-palatally to the impacted tooth, and finishing disto-palatally. The U-shape portion of the flap should point labially and pass through the edentulous area. The semilunar incision should be broad enough so that when the flap is

elevated, you will have adequate access to the impacted tooth. The incision must not violate the intact, marginal periodontal attachment of the adjacent teeth. A surgical incision is preferable to electro-surgery as it results in the preservation of more attached gingiva. The technique recommended is a split thickness flap which again helps preserve gingiva. The value of preserving the attached gingiva is well documented by Nevins and Maynard. The lack of an adequate zone of attached gingiva can lead to less resistance to mechanical, bacterial, enzymatic insult, recession, with or without root sensitivity, reduction in esthetics, and possible tooth loss. It is extremely important from an ethical, as well as a medico-legal standpoint, that the exposure of non-erupted teeth must not compromise the health of the periodontium of the exposed tooth or the adjacent teeth.

The surgical flap is elevated with the periosteal elevator and the roof of the bony crypt removed with #8 surgical bur, rongeurs, or periodontal currettes. The dental sac is removed by sharp dissection aided by currettes. If there is a cyst present, this also must be completely dissected and removed.

The surgical procedure attempts to expose only a small part of the crown of the tooth, enough so that a small bracket or lingual button may be attached. It is preferable to expose only a small amount of the surface of the impacted cuspid as this will help preserve the attached gingiva.

The surgical procedure attempts to preserve the buccal and lingual cortical plates of bone. High speed rotary instruments with a #8 surgical bur will remove the alveolar bone around the crown of the tooth. It is critical to only remove the alveolar bone around the crown and not the root. If the bone around the root is disturbed, this could cause the tooth to become ankylosed and subsequently extracted. It is recommended that a channel be cut through the alveolar bone from the impacted tooth to the archwire. Since the impacted cuspid will be guided in its eruption along the path of least resistance, this channel must be created through the bone particularly in deep impactions. Enough alveolar bone must be removed around the crown so that small brackets or lingual buttons may be attached. Use an abundance of water during the removal of alveolar bone to prevent post operative problems, and do not luxate the crown of the impacted tooth that has been recently exposed as this could cause the tooth to become ankylosed.

Summary of Supplies for Surgical and Bonding Procedure

1. Long acting xylocaine 1/50,000 epinephrine
2. #15 Scalpel Blade
3. #8 surgical bur
4. Finishing bur
5. Bracket or lingual button
6. .012 stainless steel ligature tie
7. Cotton pellets with hemostatic agent
8. Blue gel etchant in syringe
9. Dry cotton pellets
10. Bonding Adhesive (System One Plus)Ormco
11. .020 stainless steel archwire with helix loop
12. 000 silk sutures
13. Periosteal elevators
14. Rongeurs
15. Periodontal currettes

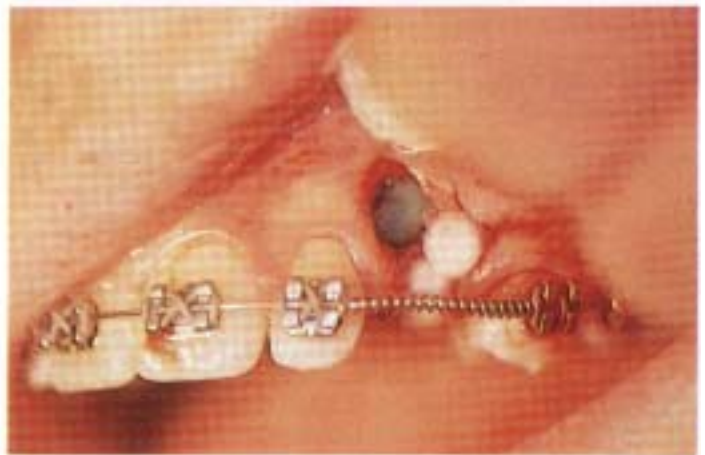
Surgical Procedures Eruption Cuspids
Slides #6-#13

Figure 6



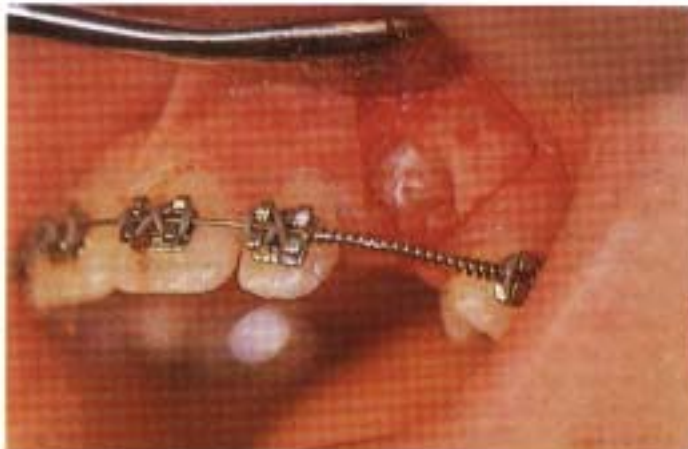
Create Space
 .018 TMA
 Open Coil

Figure 9



Etch Blue Gel
 Pack Cotton Pellets

Figure 7



Semilunar Incision
 Expose Cuspid

Figure 10



Attach Lingual Button
 .012 S.S. Ligature Tie

Figure 8



Expose Small
 Part Labial Surface

Figure 11



Suture Area
 .012 Lig. Tie Open Coil

Figure 12

*Expose Cuspid
Sept. 1987*

Figure 13

*Cuspid Erupted
Aug. 1989*

Step #9—Check for Ankylosis

After the tooth is surgically exposed, check to see if it is ankylosed. An ankylosed tooth when hit with the end of an instrument has a dull, flat sound (E flat sound). Some studies in the literature state that impacted teeth on the labial are more often ankylosed than those impacted on the lingual.

When you try to erupt the tooth towards the archwire and the cuspid is ankylosed, the anchor teeth will move towards the impacted tooth, which is undesirable. If this happens you must stop the eruptive procedure, and the best course of treatment may be to extract the ankylosed tooth. During the eruptive procedure, the impacted cuspid should be erupted slowly so as not to cause it to become ankylosed.

If you were planning to extract another tooth such as a maxillary first bicuspid to make room for the impacted cuspid, then it is better to delay the extraction until after you are certain that the cuspid is not ankylosed.

Step #10—Bonding Procedure

After surgery it is necessary to stop the bleeding, isolate the area, and create a dry field prior to the bonding procedure. Ideally you want to bond the bracket at the same appointment, otherwise granulation tissue will form over the site and have to be removed at the next appointment. For the procedure to be successful you must control the bleeding and the serum exudate. Carefully pack the surgical site with cotton pellets impregnated with a hemostatic agent. Pressure is then applied to assist with hemostasis and the bleeding usually stops within 10 minutes.

After the bleeding has ceased, use dry cotton pellets packed around the periphery of the surgical site to help prevent saliva and blood from contaminating the area. Certain things must be done so as not to initiate the bleeding.

- a) It is important to only blow gently when using the air syringe.
- b) Similarly do not rinse excessively or suction too vigorously.
- c) Do not use pumice to prepare the enamel surface as this would seriously contaminate the surgical site. The best way to prepare the exposed enamel surface is by removing the pellicle as well as any impurities using a finishing bur.
- d) There must be adequate access to the exposed tooth which will minimize the irritation of the edges of the surgical site.

- e) The ideal etchant for the bonding procedure would be a blue gel which can be dispensed in small quantities as desired using a small syringe. This is preferable to using a liquid etching solution which is much more difficult to control and could irritate the edges of the surgical site and initiate bleeding.

The .012 stainless steel ligature tie should be attached to the bracket or button and presterilized (in the case of deep impactions), prior to the bonding procedure. At the time of bonding, using the ligature tie as a handle, position the bracket or button on the exposed tooth in the most desirable position. Once placed, remove the excess bonding agent and allow it to set for 10 minutes. The point of bonding depends on how much and what portion of the tooth has been previously exposed. The mesial and distal surfaces may be more prominent depending on the inclination or rotation of the impacted cuspid. However, it is usually preferable to attach to the much broader buccal or lingual surfaces. When choosing where to position the bracket or button, the operator should take into consideration the position of the tooth, proper traction force, and direction in which the impacted tooth will be orthodontically erupted.

If the tooth is badly rotated, then it will be necessary to attach at least two lingual buttons which will then be used in combination with elastik power chain to rotate the impacted cuspid.

After the placement of the lingual buttons, and after sufficient time has elapsed (10 minutes) which allows for the bond to reach its initial set, then the .012 ligature tie may be tied gently to the helix loop of the .020 stainless steel archwire. No tension should be placed at this time between the impacted cuspid and the helix loop, as the patient already has some slight discomfort as a result of the surgical procedure and you do not want a bond failure, as it takes 24 hours for the bond to reach its maximum set. Appropriate medication would be prescribed including antibiotics and analgesics as indicated.

Step #11—a) Suturing Deep Impaction

b) Suturing Shallow Impaction

a) Suturing Deep Impaction

In the case of a deep impaction, it is better to suture over the surgical site, which will help prevent secondary infection and promote healing. Keeping the surgical site healthy will be enhanced by following the standard surgical procedures of autoclaving the surgical burs, elevators, instruments, etc., as

well as the lingual buttons and brackets which are attached to the .012 stainless steel ligature ties. The impacted tooth is then guided in its eruption along the channel previously cut in the alveolar bone using the .012 stainless steel ligature tie which is attached from the lingual button on the tooth to the helix loop on the .020 stainless steel archwire. In the case of a deep impaction, it is possible to attach alastik power chain or power thread to the brackets or buttons that are located subgingivally without reopening the surgical site, which is totally unacceptable. The only other way to use power chains which must be changed every month would be to keep the surgical site open using surgical packing. From a health standpoint, this is totally unacceptable also. Therefore .012 ligature tie is the best method for erupting cuspids when the impaction is deep.

b) Suturing Shallow Impactions

In the case of a shallow impaction it is better to suture over the surgical site which will again help prevent secondary infection. However, if the button or bracket is near the surface, in an effort to minimize the irritation caused by the bracket or button, it is advisable to cut a small window in the gingival tissue, thereby exposing the bracket or button. This relatively small area can easily be kept clean by the patient and makes it much easier in case the bracket or button has to be rebonded at a later date. Thus the patient does not have to be subjected to another surgical procedure just to reattach a bracket or button.

This method also has some advantages if the tooth is badly rotated as well. With the exposure of the lingual buttons, it facilitates the placement of alastik power chain at each appointment which allows the clinician to correct the rotation using the alastik power chain while the .012 ligature tie guides the tooth in its eruption.

Step #12—Eruptive Procedure

The rule of thumb when orthodontically erupting an impacted cuspid is to "GO SLOW". If you do not go slowly the following problems could occur:

1. Bond failure bracket or button
2. Loss of attached gingiva
3. Patient discomfort
4. Root resorption
5. Ankylosis

On average you should estimate that the eruption of an impacted cuspid should take at least 9 to 12 months.

Using the .012 stainless steel ligature tie, which is attached from the button on the impacted tooth to the helix loop on the .020 stainless steel archwire, the procedure is very simple. Every 2 to 4 weeks, depending on the patient's tolerance, the ligature tie is grasped with the hemostats at the helix loop and turned twice in a clockwise direction. Patient's tolerance means how sore the area of the impaction is following the surgery. If the patient is very sore, then no adjustment is made until the soreness disappears. Then usually you can make two turns every two weeks. When adjusting the ligature tie, it is advisable to use one finger to push the helix loop toward the impacted tooth, and with the hemostats, turn the ligature tie in a clockwise direction. Then after the adjustment, the ligature tie is tucked underneath the archwire so as not to irritate the patient. This will result in the impacted tooth moving with a constant and controlled force to a definite position on the

archwire (helix loop). The clinician has the ability to control the direction of the eruptive force with the proper placement of the button on the impacted tooth, as well as the placement of the helix loop.

The advantages to using stainless steel over alastik power chain are as follows:

1. The pressure applied with stainless steel is more constant, whereas the pressure applied with the power chain or power thread is heavy initial pressure, and then very little pressure for the balance of the month. It is much easier to gauge the forces applied with stainless steel than it is with the alastik power chain as discussed previously. Power chain becomes stretched out of shape whereas the stainless steel holds its shape and does not stretch.
2. Alastik power chain collects plaque and is more difficult to keep clean than stainless steel.
3. The stainless steel is added to the bracket or button prior to the bonding procedure. It acts like a handle which assists in the correct placement of the bracket on the newly exposed tooth. When power chain is placed on the newly bonded bracket this increases the chance of bond failure. Therefore, there is much less chance of bond failure when using stainless steel, as compared to the power chain.
4. As mentioned previously, it is much better from an infection standpoint, especially in deep impactions, to use stainless steel and suture the area over which encourages proper healing. If power chain was used, the surgical site would have to be reopened every month to reattach new power chain. Naturally this is completely impractical and undesirable from the patient's standpoint.

In conclusion, it is better to try to erupt impacted cuspids using .012 stainless steel ligature ties, but it is preferable to rotate teeth with alastik power chain with two or three strategically placed lingual buttons.

Summary and Conclusion

Since the maxillary cuspid is the last tooth to erupt on the maxillary arch mesial to the first molar, it frequently becomes impacted if the maxillary arch is constricted. An underdeveloped maxilla can also lead to lack of development of the mandible and possible TMJ problems. Therefore the treatment of the constricted maxillary arch with removable or fixed appliances is mandatory prior to any surgical procedure.

Prior to treatment, you must try to determine the cause of the impaction, as well as the location. If the tooth is impacted vertically this is ideal and the prognosis is much better than if the tooth is horizontally impacted.

While the eruption of impacted cuspids can be a very rewarding experience when accomplished successfully, no written, verbal or implied guarantees can be given to the patient. In fact, all the risks must be explained in detail including the possibility of root resorption and ankylosis, and an informed consent agreement signed prior to the treatment.

Prior to the surgical procedure, it is necessary to align the brackets, correct all rotations, create adequate space for the cuspid, and set up proper anchorage.

During the surgical procedure it is important to use a split thickness flap to preserve the attached gingiva. Also you must try to preserve the buccal and lingual cortical plates.

Following the surgical exposure of the impacted cuspid, it is necessary to check for ankylosis. If the tooth has a dull flat sound, this could indicate ankylosis, and the best form of

treatment might be the extraction of the ankylosed cuspid.

The treatment of choice in the eruption of the impacted cuspid is to attach an .012 stainless steel ligature tie from the lingual button bonded to the cuspid, to a helix loop on a .020 stainless archwire. If you want to rotate a tooth, this is best accomplished by using two or three lingual buttons, with power chain from the buttons to the helix loop.

When erupting teeth, it is important to go slowly so that the button attachment does not come off, to minimize loss of attached gingiva and to cause less patient discomfort and less chance for root resorption and ankylosis. This will enable the osteoclasts and the osteoblasts to function in a physiologically sound environment. You should not attempt to erupt the impacted cuspid more than 1 mm per month and your estimated treatment time is usually 9 to 12 months for this procedure.

Certainly when this procedure is accomplished successfully, this can truly be one of the most rewarding experiences in orthodontics. Your chance of success however will be greatly increased if you follow some of the principles as outlined.

*Brock H. M. Rondeau, D.D.S., I.B.O.
1275 Highbury Ave., #16A
London, Ontario
Canada N5Y 1A8
(519) 455-4110*

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ERUPTION OF MAXILLARY CUSPID CASE REPORT

Dr. Brock Rondeau

AGE:	Male Age 15 years 5 months	Chief Complaint 3
PROFILE:	Prognathic	TMJ Normal range of motion. No tenderness to palpation.
FUNCTIONAL PROBLEMS:	Lateral tongue thrust Right side	
SKELETAL PROBLEMS:	Class TTT skeletal Normal maxilla Prognathic mandible Skeletal closed	Summary of Archwires .0175 Respond (Ormco) .018 NiTi (Ormco) .020 Stainless Steel (Helix Loop) .018 TMA (Ormco) .019 × .025 Force 9 (Ormco) .019 × .025 TMA (Ormco)
DENTAL PROBLEMS:	Normal overjet Normal overbite Lower anteriors lingual 3 Impacted 3 Labial, mesial	

Figure 1



Initial Frontal

Figure 2



Initial Frontal
3 Impacted
3 Labial

Figure 3



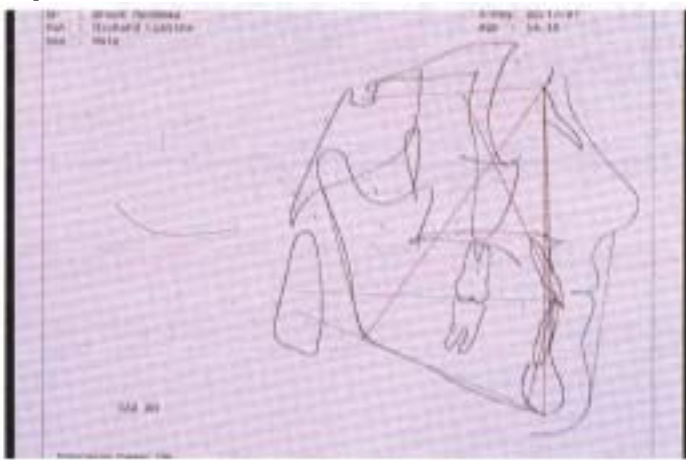
Initial Cephalometric Film

Figure 4



Initial Panoramic Film

Figure 5



Initial Cephalometric Tracing

Figure 6

100 00 Analysis Report

Subject: J. Bruce Jones
 Patient: J. Bruce Jones
 Age: 16.57
 Sex: Male
 X-Ray Date: 10/19/87

SNA Angle	83	83.4
SNB Angle	85	85.0
SNP Angle	2	0.0
Posterior to AN distance		4.0
Posterior to AN (mm)	20.2 to 20.7 mm	22.0
ANS to Hangle distance		79.1
Mix analysis	0.00	0.00
A to B ratio	-0.2 to -0.7 mm	0.0
Posterior to B ratio	-0.2 to -0.7 mm	0.0
Mix ratio	70.0 to 100	100.0
Mandible length	87 to 101	94.0
Maxilla length	117 to 121	118.0
Upper incisor to R angle	100	115.0
Lower incisor to R angle	20 degree	84.0
Upper incisor to Hangle	5 mm	5.0
Lower incisor to Hangle	7 to 8 mm	7.0
Upper incisor to AN distance	10 mm	20.0
Lower incisor to AN distance	40 mm	40.0
Upper incisor to AN angle	22	24.0
Lower incisor to AN angle	70 to 75 deg	70.0
Upper incisor to AN	70 to 75 deg	70.0
Lower incisor to AN		100.0

Initial Cephalometric Readings

Figure 9



Surgically expose 3
 Semi lunar incision
 Palatally located
 Adequate space for cuspid

Figure 10



Prepare anchorage
 .020 S.S. Helix Loop

Figure 13



Eruption after 2 months
 .020 S.S. Helix Loop

Figure 14



Eruption after 12 months
 .019 x .025 TMA

Figure 7



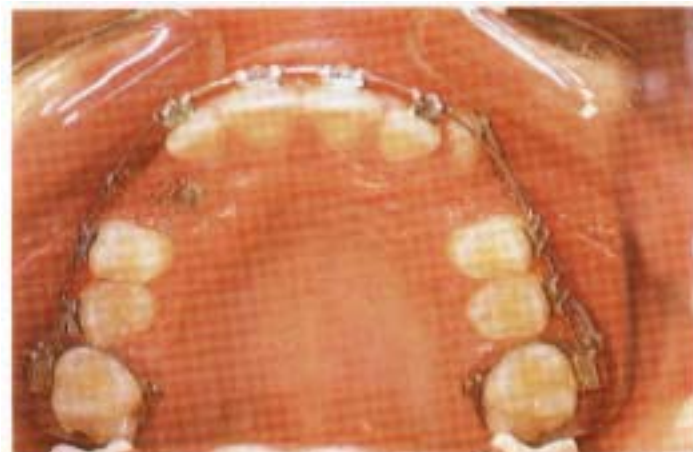
*Initial Right Lateral
3 Impacted
Posterior Open Bite
Lower anteriors tipped lingually*

Figure 8



*Initial archwires
Level, align, rotate
.0175 Respond Mx*

Figure 11



Cuspid attached to .020 S.S. Helix Loop with .012 Ligature tie

Figure 12



*Eruption after 2 months
.020 S.S. Helix Loop*

Figure 15



*Initial Left Lateral
3 Labial, mesial*

Figure 16



*Level, align, rotate
.018 TMA Power chain 2 2
Lingual button 3*

Figure 17



Retract 3 power chain
Power chain 3 to 4
Helix loop mesial to 4
Acts as a stop to prevent 4 from moving mesially

Figure 18



Retract 3 Lingual Button Tie with .012 ligature tie to .020 S.S. archwire

Figure 21



Continue L.A.R.
.018 NiTi

Figure 22



Eruption 3
Retraction 3
.020 S.S. Helix Loops

Figure 25



3 Retracted, aligned
.019 x .025 TMA Mx
.019 x .025 Force 9 Md

Vertical elastics
Power chain 3 3
3 3
Leopard 1/4" 802

Figure 26



Initial Right Lateral
March 1987

Figure 19



Level, align, rotate .0175 Respond tied to bottom of bracket 3

Figure 20



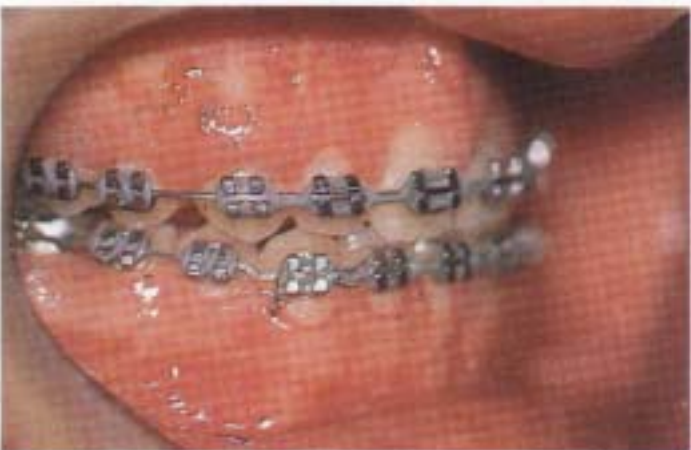
Level, align, rotate .0175 Respond

Figure 23



Lingual Button 3
3 3 Aligned
.018 NiTi

Figure 24



3 Erupted, aligned
.019 X .025 TMA Mx
.019 X .025 Force 9 Md
Step up 5,4
Power chain 3 3
3 3

Figure 27



Final Right Lateral
October 1988

Figure 28



Initial Occlusal
Deciduous c c
March 1987

Figure 29



*Final Occlusal
Erupted 3 3
October 1988*

Figure 30



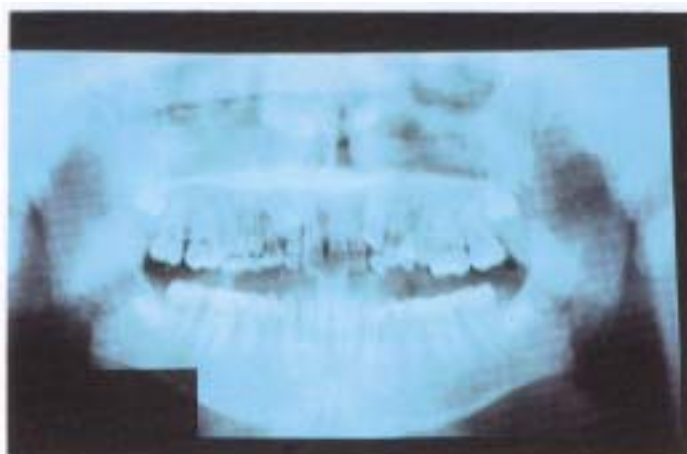
*Initial Left Lateral
March 1987*

Figure 33



Final Cephalometric Film

Figure 34



Initial Panoramic Film

Figure 37



*Final Frontal
October 1988*

Figure 38



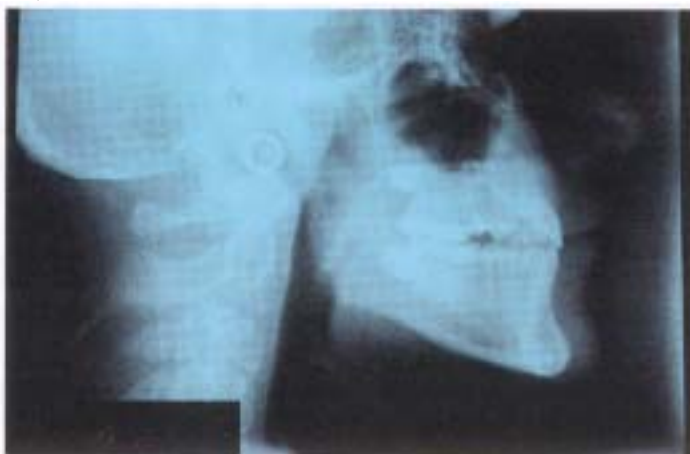
*Initial Frontal
March 1987*

Figure 31



*Final Left Lateral
October 1988*

Figure 32



Initial Cephalometric Film

Figure 35



Final Panoramic Film

Figure 36



*Initial Frontal
March 1987*

Figure 39



*Final Frontal
October 1988*

Dr. Brock Rondeau, Diplomate of the International Board of Orthodontics, past president and certified instructor of the IAO (International Association for Orthodontics), has completed more than 1,500 hours of postgraduate orthodontic training and has over 600 active orthodontic patients, and is the mentor for 9 advanced study clubs. Dr. Rondeau is currently one of Canada's most sought after clinicians and has taught orthodontics to well over 1,200 dentists in the United States and Canada. Dr. Rondeau will be a featured speaker at the 1991 National AAFO Conference in Washington, D.C.



*Brock H. Rondeau, D.D.S.
1275 Highbury Avenue, #16A
London, Ontario, CANADA
N5Y 1A8*