



Management of impacted canine using different attachments and auxiliaries - A review

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ABSTRACT

Impacted tooth is the tooth which is partially unerupted and is positioned against bone or soft tissue or adjacent tooth so that its eruption is unlikely. Various orthodontic techniques are used to recover the impacted tooth into the arch. There are bondable attachments and non-bondable attachments used to precisely position the impacted canine in the arch. The aim of this article is to summarize the literature of management of impacted canine.

KEYWORDS : Attachments, elements, impaction, auxiliaries, occlusion

Introduction

Impaction was derived from the latin word impactus which means pushed against. Canine plays an important role in forming the foundation of an esthetic smile and maintaining the functional occlusion as it is a critical tooth and the cornerstone of the mouth. Some factors interfere in the development and eruption of canine and cause serious consequences. Hence a thorough knowledge and management of these impacted teeth is required to achieve the ideal, hormonal and functional occlusion. The different attachments ,auxiliaries and elements to guide the canine into occlusion are as follows,

ATTACHMENTS

Non Bondable	Bondable
Lasso wire	Cast caps
Threaded pin	Orthodontic bands
	Orthodontic brackets
	Simple eyelet
	U-Flex attachment
	Magnets
	Titanium Button With Chain
	Gold button with chain
	Gold mesh disk with chain

NON BONDABLE ATTACHMENTS

1) Lasso wires

They are stainless steel wires of either 0.010,0.012 or 0.014 inches which are twisted lightly around the neck of the impacted canine and ligated to the arch wire.



Disadvantages: This results in irritation of the gingiva and prevents reattachments of the healing tissues in area of CEJ (cemento-enamel junction). May produce areas of external resorption & ankylosis in areas of CEJ.

2) Threaded Pins



Pins provide the attachment for an impacted tooth.

Disadvantages: Subsequent restoration is required for the tooth. Its Difficult to place the threaded pin along the long axis of the tooth because of smaller surgical exposure done. A hole is drilled to receive the restoration and this may enter the pulp chamber.

BONDED ATTACHMENTS

1) Cast canine caps – given by Lewis and Dewel. They require extensive crown preparation



2) Orthodontic bands

Advantage: They are compatible with the health of periodontal tissues.



Disadvantage: Large surgical field required. If moisture control inadequate may hamper with the cement-band bond.

3) Standard Orthodontic Brackets : Any edge-wise, Begg's, preadjusted edgewise brackets can be used.

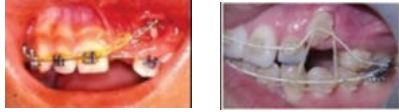


Disadvantages : As the bracket base is wide, it is difficult to adapt to any other tooth surface except for the buccal surface. The bracket's shear bulk creates irritation as the tooth is drawn from the soft

tissue.

4) Ligature wire or elastic thread - They are tied to the bracket to bring the impacted tooth into the arch but the disadvantage is they interfere with the investing tissues leading to inflammation and damage of the tissues. As the impacted tooth advances into the arch and the exuberant gingival tissues bunches in front of it & causes **pinching** between the bracket & tissues.

5) Rubber bands and elastomeric chains- E-chains and rubber bands also can be used in guiding the canine into occlusion

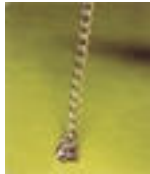


6) Simple eyelet Advantages:



An eyelet welded to band material with a mesh backing is soft & easy to contour making its adaptation to bonding surface more accurate which makes for superior retentive properties. They are smaller in size and hence can be placed in any impacted tooth whose directions are worse. It is less irritating to the surrounding tissues.

7) U-FLEX Eruption Device



Its base is U-shaped and is flexible to fit snugly to an incisal edge. Has low profile to reduce the risk of dehiscence of overlying soft tissue flap. It is coated with titanium nitride.

8) Titanium Button With Chain- Given by Nezar Watted. Manufactured by Dentauram.



9) Magnets

It is made up of rare earth lanthanide alloys. It is rarely used



Disadvantage: may cause corrosion.

10) Intermediaries/Connectors: They maintains the contact with the attachment, before it is bonded to the tooth. Various connectors can be:

- a) gold chain
- b) stainless steel ligature wire
- c) Elastic ties and modules

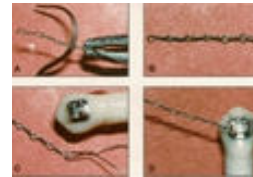
a) Gold Chain-Gold chain has found a surprising degree of acclaim and acceptance worldwide in view of the fact that it appears to be unnecessarily sophisticated, expensive and not widely

available. Although it is undoubtedly suitable and sufficiently strong for the purpose.



Drawback: The end of the chain needs to be held in a locking tweezers or artery forceps until it is ligated to its active traction element (spring or elastic thread). If this is not done, then the fine-linked chain may collapse down and slip between the recently sutured edges of the flaps and be lost from sight.

b) Stainless Steel Ligature wire- Dead soft stainless steel ligature wire of **0.011** or **0.012** inches thickness is generally most suitable.



The wire should be braided in such a way that after each two or three turns of the braid is followed by a small loop. In this way, the braid comprises a convenient chain of loops, which may be shortened as necessary by cutting off the excess.

c) Elastic ties and modules

Advantages: Application of light forces, Good range of action and Easier to tie



Disadvantage: Tends to loosen and High degree of force decay

11) Force Generating Devices

Cantilevers and Box Loops-**Surendra Patel et al** demonstrated the use of TMA cantilevers to extrude as well as to achieve 1st and 2nd order corrections.



Steps followed are: 1. Initial extrusion mechanics with a cantilever.

2. Box loop is used to continue the extrusion of canine and also to make 1st- and 2nd-order corrections. Loop is activated based on the desired canine position in two planes of space, that is the horizontal and the sagittal plane. A box loop is constructed of **0.017" x 0.025" TMA wire**. It is effective in providing **1st- and 2nd-order corrections** while continuing the eruption of an impacted canine.



'12) Nickel Titanium Closed-coil Spring- Nickel titanium closed-coil spring without end loops.



Procedure

Pull out one end of spring slightly to form a small hook. Twist the hook a couple of times and link it with an elastomeric chain. Activate the spring and wrap several links around a stable rectangular archwire with an occlusal step. Be sure to leave a "tail" of chain for reactivation. At the next visit, unwrap, reactivate, and rewrap the spring.

13) THE MONKEY HOOK

This has an open loop on both the ends



Monkey hook is a simple auxiliary used. This has an S-shaped design which was inspired by the game Barrel full of Monkeys.

14) Australian Helical Archwire -Made in **special plus 0.016"** Australian archwire. Helices are given in the wire which works as stops to maintain the space for the erupting canine against the brackets of adjacent teeth.



An additional incisal helix anchors the connector running to the canine. Activated by twisting the ligature until the correct deflection is achieved and the desired force is applied to the impacted tooth. Further activation is performed every two weeks by twisting the steel ligature a few turns.

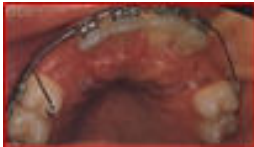
15) Active palatal arch (Becker 1978)

This has a removable palatal archwire with omega loops on each side, it is made up of 0.020 inch



To get a frictionless fit in lingual sheath the wire ends are double ended. Activation is done by elevating the palatal archwire downward by hooking the ligature wire around it.

16) Ballista Spring- Ballista spring is made up of 0.014, 0.016, 0.018 inch stainless steel round wire.



This accumulates energy in the horizontal part of the wire by twisting it along the long axis. This part of the wire is attached by a ligature on the first premolar, which allows it to rotate in the slot of the bracket as a hinge axis. If the vertical portion of spring is raised towards the tooth which is impacted, it accumulates energy in the horizontal part and if the vertical section releases, it bumps down like a ballista. Anchorage is provided by giving a transpalatal arch. It can be used in both buccally and palatally impacted tooth.

Modifications:

- 1) When the spring is inclined forward or backward.
- 2) When the spring is lengthened or shortened.

Advantages:

Can take the impacted tooth towards the middle of the palate separating the impacted tooth with the adjacent tooth roots. Once attached to the hook, it becomes tangent to the oral mucosa and it does not disturb the patient. Spring provides a continuous force. It can also be used to retract other impacted teeth.

17) Buccal Auxiliary Archwire



It is made up of 0.014 or 0.016 inch round SS wire with single vertical loop. This loop has a small helix. This wire is tied with the basal arch wire in piggyback fashion. Activated by engaging the connector to the helix.

18) K-9 SPRING



Advantages: Simple in design, Low cost, no patient compliance and Light continuous forces

The K-9 spring is made of **0.017" X 0.025" TMA** wire. The horizontal arm of the spring is inserted into the first molar buccal tube and the premolar brackets About **7 mm** mesial to the first premolar bracket, the horizontal arm is bent 90° downward to form a vertical arm, which is about **11mm long** and ends in a helix. The vertical arm is bent about **20 degree inward**, towards the palate.

Activation: Vertical arm swung upward and ligated to bonded attachment on impacted canine. Spring **cinched back about 2mm** to provide force needed to distalize canine. Alternative bending the vertical arm distally before ligating it to canine.

19) Mandibular Anchorage



The lingual arch is fabricated with 0.036 inch stainless steel wire. Vertical hooks (5 to 6 mm in length) are soldered to it. Traction with light forces is applied via directional elastics.

20) Mandibular Removable Appliance



It consists of Adams clasps with hooks through which elastic is applied from clasp to the connector. This provides the necessary extrusive force for the eruption of canine.

21) Implant Supported De-impactor System (ISDS)



Type I: Two lingual sheaths with rectangular opening are soldered

to a steel cap, which is attached to the palatal implant. 0.032 "TMA springs inserted in each lingual sheath for maxillary molar distalization. Two 0.040" stainless steel arms are soldered to the mesial portion of the steel cap for initial extrusion

Type II: 0.032" TMA springs are inserted in the lingual sheaths as cantilever arms to produce extrusion of impacted canine in the vertical plane. Labial movement- cantilever arms activated in horizontal plane.

22) Kilroy Spring-Kilroy Spring reminded the designers of the popular "Kilroy Was Here" graffiti. Two types of Kilroy springs were described.

Kilroy I Spring : It produces more lateral and vertically directed forces to direct the palatally impacted tooth.



Kilroy II Spring : Was used in case of buccally impacted tooth to apply more vertical eruptive forces for eruption



23) Semi fixed appliance- to achieve a favorable path of eruption a semi fixed appliance is used. It consists of circumferential clasps and a nance button. C clasp to maintain the space between lateral incisor and premolar for aligning the canine. Nance button for the anchorage. Semi fixed appliance is cemented after surgical exposure of the tooth. Attachment is placed and ligature wire is tied to the c-clasps.



24) TMA sectional wires – sectional archwires made of 17x25 and 19x25 TMA are used to guide the labially impacted canine into occlusion. Impacted canine can be segmentally moved using TMA archwires and loops.



Auto transplantation: If Patient's ability to cooperate is critical.



This Procedure is best performed when the root length of the transplant is between one half and three fourths complete. The recipient site must be healthy and of adequate size to receive the

transplant; it is important that the recipient site be prepared before the transplant is made available. Tremendous care must be exercised not to insult the root surface; wherever possible, the transplant should be handled only by its crown. Desiccation of the periodontal ligament can cause resorption, ankylosis, and failure so the length of time from removal to reinsertion should be short; ideally, this is a nonstop relocation. Circumferential ligation with metallic sutures is contraindicated. Soft-tissue reproximation and ligation with silk sutures constitute a preferred form of fixation during the first ten days. Further stabilization can be employed through direct bonding, if necessary, for from 10 days to 6 weeks. After this time the tooth should be treated like any other tooth of similar developmental stage. Favourable prognosis is 100 percent for a properly prepared autogenic dental transplant.

Conclusion

Managing impacted canine is of a greatest challenge for an orthodontist and always important in achieving ideal esthetics and function. Success depends upon the favourability of the impacted canine, patient cooperation, orthodontic traction and the type of attachment used. Problems associated with impacted canines are numerous and has generated a lot of interest in the orthodontic field to manage the pathway of eruption particularly in the mode of treatment. There are various attachments that can be used in getting the canine into occlusion depending on the type of impaction. Orthodontic management of canine is a very complex procedure and requires carefully planned interdisciplinary approach. A thorough knowledge of various methods to manage these impacted canines in different clinical situations that are best suited to guide them into the arch is required.

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