Critically Appraised Topic (CAT)

Project Team:
4A5
Project Team Participants:
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Clinical Question:
When should impacted canines be uncovered and what is the best way to go about it.
PICO Format:
P:
Impacted canines in adolescents undergoing orthodontic therapy
I:
Surgical intervention for facially impacted canines
C:
Treatment modalities for facially impacted canines
O:
Correction of malocclusion
PICO Formatted Question:
In adolescents with impacted canines undergoing orthodontic therapy, would surgical intervention or nonsurgical intervention be more effective in correcting malocclusion of facially impacted canines.
Clinical Bottom Line:
Impacted teeth are considered a dental anomaly. Impacted canines are the most common impacted teeth and they are more frequently impacted palatally than labially. Impacted canines are more commonly seen in females than males. With labially impacted can
Date(s) of Search:
10/17/20, 10/19/20
Database(s) Used:
Pubmed
Search Strategy/Keywords:
Labially impacted canines, treatment, surgery
MESH terms used:
Impacted canines, tooth, therapy, labial
Article(s) Cited:
- **Bedoya MM, Park JK. A Review of the Diagnosis and Management of Impacted Maxillary Canines. J Am Dent Assoc. 2009 Dec; 140 (12):1485-93. Doi:**

10.14219/jada.archive.2009.0099. PMID: 19955066. https://0-pubmed-ncbi-nlm-nih-gov.libus.csd.mu.edu/19955066/

- Chiara, Cassina, Spyridon N Papageorgiou, Theodore Eliades, Open versus closed surgical exposure for permanent impacted canines: a systematic review and meta-analysis. European Journal of Orthodontics, Volume 40, Issue 1, February 2018, Pages 1-10, http://0-doi-org.libus.csd.mu.edu/10.1093/ejo/cjx047
- Grisar K, Luyten J, Preda F, Martin C, Hoppenreijs T, Politis C, Jacobs R. Interventions for impacted maxillary canines: A systematic review of the relationship between initial canine position and treatment outcomes. Orthod Craniofac Res. 2020 Aug 15. Doi: 10.1111/ocr.12423. Epub ahead of pring. PMID: 32799419. https://0-onlinelibrary-wiley-com.libus.csd.mu.edu/doi/full/10.1111/ocr.12423

Study Design(s):

Bedoya Article:

A review

Chiara Article:

A Meta-analysis and Systematic Review of RCTs

Grisar Article:

A Systematic review of Cohort Studies

Reason for Article Selection:

Bedoya Article:

- **Though the level of evidence is not the highest and was published in 2009, I selected this article because it is a clinical review discussing both palatally and labially impacted canines. The article addressed the etiology of impacted canines as well as the various treatment options available to correct this dental anomaly.**

Chiara article:

- **I selected this article because it has a high level of evidence as a meta-analysis and systematic review. The article was published in 2017 so the information is new and relevant with todays improved treatment modalities.**

Grisar Article:

- **I selected this article because it has a high level of evidence as a systematic review. The article was also published in August of 2020. I also selected this article because it addressed the position of the canine and treatment modality success based on the position of the impacted canine.**

Article(s) Synopsis:

Bedoya Article:

The most commonly impacted tooth is the maxillary canine. Most frequently, the tooth is palatally impacted, however, in some instances, it can be labially impacted. When the tooth is labially impacted, there is a 17% chance there will be adequate space for the tooth, thus, an arch length discrepancy is thought to be a primary etiologic factor. Other etiologic factors of impacted canines include prolonged retention of the primary canine, failure of the primary canine root to exfoliate, ankylosis of the permanent canine and many others. Imacted canines can cause migration of neighboring teeth and a loss of arch length as a result and lateral root resorption of the permanent lateral incisors. The article stressed the importance of early detection and diagnosis of the position of the impacted canine for proper treatment planning. If a child is 9-10 years of age and is missing a labial bulge, then the permanent canine is likely impacted and treatment is indicated. When an lateral ceph is taken at 8-9 years of age, if the canine is angled medially, with the crown located medially to the lateral border of the nasal cavity, then the possibility of impaction should be considered. Interceptive treatment is preventing maxillary canine impaction and is the ideal form of treatment to the best long term results. Patients age and degree of impaction greatly influence the success of interceptive treatment. Extracting the primary maxillary canine before age 11 may be the best way to guide a displaced permanent canine into position. When the primary canines are extracted, 91% of cases where the canine crown is distal to the midline of the lateral incisor are said to passively erupt into proper position but canine crowns that are impacted mesially to the midline of the lateral incisor roots are said to passively erupt into proper position 64% of the time. In other words, after the extraction of the primary canine, the chance of eruption decreases as the horizontal angulation of the permanent canine increases but the probability depends more on the degree of overlap with the lateral incisor than the angulation. Another common method of retrieving the impacted canines is surgical exposure in the early or late mixed dentition. A bonded attachment is placed onto the tooth and then orthodontic forces guide the tooth into occlusion. The article duscissed three methods for uncovering labially impacted canines. The methods include a gingivectomy, creating an apially positioned flap and using closed eruption techniques. A gingivectomy is indicated when the canine cusp is coronal to the MGJ, there is adequate keratinized ginigva present and the canine is not covered by bone. When a gingivectomy is completed, orthodontic traction is not usually necessary because the tooth tends to erupt normally. An apically positioned flap is indicated when the canine crown is apical to the MGJ and the amount of attached gingiva is minimal. When an apically positioned flap is indicated, orthodontic therapy is required and can typically begin two to three weeks after surgery. The last option is a closed eruption technique and is selected whe the tooth is in the center of the alveolus and the crown is significantly apical to the MGJ. When a closed eruption technique is indicated, orthodontic therapy may begin one to two weeks after surgery. There are four criteria for determining the proper techniques for surgically exposing labial (intra-alveolar) impacted maxillary canines. These criteria include, the labiolingual position of impacted canine crowns, the vertical position of the tooth

relative to the mucogingival junction, the amount of gingiva in the area of the impacted canine and the mesiodistal position of the canine crown. The worst case scenario and the least common treatment is extracting the permanent maxillary canine. This treatment is not commonly seen as the canine is critical to esthetics and occlusion. Extractions typically take place if the canine is severely affected anatomically or has severe limitations in its location.

Chiara article:

Common approaches for managing impacted canines include early interceptive measures or late interseptive measures including extraction, autotransplantation and surgical exposure. The two main surgical approaches used are open and closed techniques. The open technique is a surgical approach that removes the bone and soft tissue directly over the impacted canine or uses an apically repositioned gingival flap to expose the tooth and either guide it orthodontically or allow it to spontaneously erupt. A closed technique is a surgical approach that requires raising a full mucoperiosteal flap, exposing the canine and bonding an orthodontic attachment onto the exposed tooth. With a closed technique, orthodontic movement is required after healing. Meta-analysis of three studies on the initial alignment of the impacted canines to the dental arch indicated that an open expose technique reduced the duration of treatment by 2.14 months when compared to a closed exposure. There were no statistically significant secondary outcomes such as canine discoloration, post op pain, of difficulty eating between open and closed exposure techniques. An open exposure, however, was associated with significantly lower odds of ankylosis. Initial alignment of the impacted canine into the dental arch took 4.7 months less for labially impacted canines than palatally impacted canines. Open expose procedures were found to require less bone removal for labially impacted canines than closed expose procedures. There was a higher reported alignment failure of impacted canines treated with closed techniques due to scar tissue formation, improper traction direction and the presence of dense connective tissue in the way of eruption of the canine. Overall, open expose techniques are superior to closed expose techniques in initial alignemt and decreased risk of ankylosis.

Grisar Article:

A detailed evaluation of the canines location, angulation and orientation is critical to determine the proper course of treatment. The treatment options for impacted canines include interceptive treatment such as removal of the primary canine, headgear, rapid palatal expansion and late interceptive treatment such as surgical exposure with or without orthodontic traction, transplantation of impacted canines in the arch, extraction of the permanent canine, or no treatment and preservation of the primary canine. The article discussed the position of the impacted canine and the success of treatment. The mesiodistal and vertical location influenced the treatment duration. Buccally impacted canines are most often associated with arch length discrepancy, thus interceptive therapy is a successful

treatment option. Extracting deciduous canines, rapid palatal expansion and/or headgear all help gain space or reduce loss of space in the arch for the permanent canine. The open surgical technique for buccally positioned canines includes an apically repositioned gingival flap where the canine may be left to spontaneously erupt or be bonded to an orthodontic attachment to guide the tooth into positon. The closed technique involves a full mucoperiosteal flap which exposes the canine crown and then an orthodontic attachment is bonded to the tooth. The open technique has been statistically superior to the closed technique in that there is a decreased risk of ankylosis and reduced length of treatment. Different traction methods are used when orthodontics is needed. For canines in a less favorable position, fixed appliances are almost always required however removable appliances can be considered for canines in more optimal position. With fixed appliances, traction can be applied with flexible piggyback archwires, elastomeric chains or strong rigid buccal arms. Buccal impactions may be easier to put into position than palatally impacted molars as they are close to the occlusal table, but buccal impactions are more challenging to manage without long term periodontal consequences. When treating buccally impacted canines, a more advanced root development stage, greater mesial sector (proximity to lateral incisors) and high vertical impaction can make treatment more difficult and compromise the periodontal status even more. In the case of buccally impacted maxillary canines, a more horizontal position will worsen the periodontal outcomes.

Levels of Evidence: (For Therapy/Prevention, Etiology/Harm)
See http://www.cebm.net/index.aspx?o=1025

☒ **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)
☐ **1b** – Individual RCT
☒ **2a** – Systematic Review of Cohort Studies
☐ **2b** – Individual Cohort Study
☐ **3** – Cross-sectional Studies, Ecologic Studies, "Outcomes" Research
☒ **4a** – Systematic Review of Case Control Studies
☐ **4b** – Individual Case Control Study
☐ **5** – Case Series, Case Reports
☐ **6** – Expert Opinion without explicit critical appraisal, Narrative Review
☐ **7** – Animal Research
☐ **8** – In Vitro Research

Strength of Recommendation Taxonomy (SORT) For Guidelines and Systematic Reviews
See article **J Evid Base Dent Pract 2007;147-150**

☒ **A** – Consistent, good quality patient oriented evidence
☐ **B** – Inconsistent or limited quality patient oriented evidence
☐ **C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

Conclusion(s):
Overall, there are many treatment options available as therapy for impacted maxillary canines. These treatments include early interseptive therapy such as extracting the primary canine, headgear or rapid palatal expansion as well as late interseptive therapy which includes an open or closed surgical approach. Of these therapies, it is best to treat and manage impacted canines as early as possible to reduce the risk of ankylosis. In patients in the early mixed or late mixed dentition it is best to extract the primary canine to provide sufficieny arch length for the permanent canine to naturally erupt into position. In patients in the late mixed or early permanent dentition, surgical intervention may be needed to guide the impacted canine into position. Overall, buccally impacted canines are easier to treat than palatally impacted canines, however, periodontal consequences may arise more frequently.