**Critically Appraised Topic (CAT)**

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| **Project Team:** |
| **3B-3** |
| **Project Team Participants:** |
| **Kanika Manchanda, Timothy Knoll, Mitchell Piacsek, Sofia Enea, Mitchell Splinter** |
| **Clinical Question:** |
| **What factors influence the timing of orthodontics in adults** |
| **PICO Format:** |
| **P:** |
| **Patients in need of orthodontic treatment with a history of dental trauma** |
| **I:** |
| **Early orthodontic movement** |
| **C:** |
| **Orthodontic movement after full healing** |
| **O:** |
| **More favorable orthodontic outcomes** |
| **PICO Formatted Question:** |
| **In adults in need of orthodontic treatment with a history of dental trauma, does earlier orthodontic movement or later orthodontic movement after complete PDL healing lead to a better outcome for the patient?** |
| **Clinical Bottom Line:** |
| **Based on the current clinical guidelines, it is recommended that orthodontic movement commence after full healing of the PDL to decrease the risk of ankylosis and root resorption, however, due to the rare nature of these situations and lack of high quality evidence, more research in this area is needed.** |
| **Date(s) of Search:** |
| **11/1/20, 11/2/30** |
| **Database(s) Used:** |
| **Pubmed** |
| **Search Strategy/Keywords:** |
| **Orthodontic movement, history of dental trauma, timing** |
| **MESH terms used:** |
| **Orthodontics, Corrective, Tooth Injuries/Complications, Incisor/Injuries, Tooth Movement Techniques/Methods, Time Factors** |
| **Article(s) Cited:** |
| 1. **Caliskan, MK, Cinsar, A, Turkun, M, Akkemik, O. 1997. Delayed endodontic and orthodontic treatment of cross bite occurring after luxation injury in permanent incisor teeth. Endodontics and Dental Traumatology. 13: 292-296.** 2. **Kindelan, SA, Day, PF, Kindelan, JD, Spencer, JR, Duggal, MS. 2008. Dental trauma: an overview of its influence on the management of orthodontic trearment. Part 1. Journal of Orthodontics. 35: 68-78.** 3. **Owtad, P, Shastry, S, Papademetriou, M, Park, JH. 2015. Management Guidelines for Traumatically Injured Teeth during Orthodontic Treatment. The Journal of Clinical Pediatric Dentistry. 39(3): 292-296** |
| **Study Design(s):** |
| 1. **Case report (5)** 2. **Clinical Practice Guideline (1a)** 3. **Narrative Review/Case Report (6/5)** |
| **Reason for Article Selection:** |
| 1. The article was selected because it presents a case that is similar to the patient’s situation. 2. **This article was selected as it directly answers the PICO question and is a high level of evidence.** 3. **This article was selected as it directly answers the PICO question and presents a case that is similar to the patient’s situation.** |
| **Article(s) Synopsis:** |
| 1. A patient presented to the dentist with with a chief complaint of dull pain in the area of the upper right central and lateral incisors. The patient had a history of a traumatic fall 12 months prior that resulted in palatal luxation of the maxillary right central and lateral incisors into crossbite and avulsion of the mandibular right central and lateral incisors. The upper right incisors were diagnosed as necrotic with acute apical periodontitis and endodontic therapy was initiated and the teeth were filled with calcium hydroxide, which was replaced four times over a six month orthodontic treatment period in an effort to prevent root resorption during orthodontic correction of the crossbite. Following orthodontic treatment, the canals were definitively filled with gutta percha, internal bleaching was performed, and the patient was recalled every three months for the first year to monitor for any root resorption. Due to existing crowding in the lower anterior segment, the space remaining from the loss of the lower right incisors was closed via orthodontic movement alone. No internal or external root resorption occurred during or after movement. The authors hypothesized that this was due to calcium hydroxide’s antimicrobial effects and alkaline pH, which prevents osteoclastic activity and encourages repair. The authors advocated for long-term continued monitoring of traumatized teeth in case of future resorption. 2. **This paper was intended to be a clinical guideline for orthodontic treatment of teeth with a history of dental trauma after a review of current evidence. The authors advocate for a thorough risk assessment, history, clinical exam, and radiographic exam be performed prior to initiation of orthodontic therapy when trauma is suspected. Early correction of Class II malocclusion with excessive overjet is typically not recommended due to the need for extended treatment time over two separate treatment phases. They found the effect of orthodontic movement on pulp necrosis to be inconclusive. The authors indicated that there is evidence that orthodontic movement leads to cemental damage due to osteoclastic activity, and therefore should be delayed until post-traumatic healing has occurred for a period that corresponds to the severity of the injury to prevent increased resorption. Specific to lateral luxation and endodontically treated teeth, the recommendation was a one year waiting period prior to orthodontic movement. The authors recommended radiographic evaluation of traumatized teeth at six months into orthodontic treatment with more frequent radiographs if root resorption is evident. A three month healing period was recommended prior to continuing treatment in the case of severe resorption. They found blunt or pipette-shaped roots, jiggling orthodontic forces, and a history of trauma increase the potential for root resorption. The review found that long term calcium hydroxide treatment led to better cemental healing, but may lead to increased root fracture risk as dentin strength decreases during twelve week calcium hydroxide treatment to 56.1% of its initial strength, suggesting prolonged calcium hydroxide treatment is contraindicated and definitive obturation with gutta percha and sealer is recommended prior to orthodontic treatment. They recommended a one year healing period after endodontic therapy due to trauma to allow full healing without increasing risk of resorption or ankylosis, but stipulated there is always an increased risk of resorption and ankylosis in teeth with a history of trauma. Physiological stiumulus to the traumatized tooth was recommended as it leads to increased healing of cemental and PDL tissues and prevention of ankylosis, therefore, a rigid splint was not recommended during healing.** 3. **This narrative review emphasized the importance of individual treatment planning and clinical judgement during orthodontic treatment of traumatized teeth due to their rare nature. Central incisors, especially in Class II division I malocclusions with excessive overjet, have the highest risk of trauma. It emphasized that the type of trauma experienced by the patient significantly affects the treatment recommendations. In the case of lateral luxation, this article recommended a six month waiting period before orthodontic movement. The article suggested that teeth with a history of trauma more than one year prior to orthodontic treatment have an increased risk of root resorption and that lip and tongue dysfunctions can lead to continued trauma for the affected tooth. Pulpal inflammatory responses are exaggerated in previously traumatized teeth, leading to a higher risk of resorption. Three month follow ups were recommended to ensure pulp vitality if the tooth is vital after trauma. Lighter orthodontic forces were recommended for teeth with a history of trauma, and the treatment plan should be altered to address this. The second half of the article was a case report of a 17 year old male who had trauma to his permanent maxillary central incisors during orthodontic treatment resulting in lateral luxation with palatal displacement and anterior crossbite. The teeth could not be repositioned under local anesthesia, and due to traumatic occlusion with the mandibular anterior teeth, the decision was made to immediately move the teeth using light orthodontic forces, ignoring the clinical guideline of wating six months. Orthodontic correction was completed after six months. The teeth remained vital throughout treatment, but the root tips became blunted due to mild resorption and the PDL space remained widened due to the injury at the conclusion of treatment.** |
| **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):** |
| **Bases on the literature reviewed, my recommendation for this patient would be to wait until one year after the injury to begin orthodontic treatment to allow for better PDL and cemental healing and prevent root resorption and ankylosis. There was some inconsistency to this recommendation between the clinical guideline from 2008 and the narrative review from 2015 (one year vs six month waiting period recommended respectively), however the clinical guideline presented more thorough research and stronger evidence. Additional recommendations would include a thorough clinical and radiographic recall program every three months during healing and orthodontic treatment to monitor for resorption and ankylosis as well as lighter orthodontic forces to be used on the previously traumatized tooth. In addition to these recommendations, a conversation should be had with the patient about the increased risk of root resorption and ankylosis of this tooth during orthodontic movement due to the history of trauma, regardless of the healing period chosen.** |