Second-Molar Substitution of All Permanent First Molars using Nitrous-Oxide Sedation

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Introduction

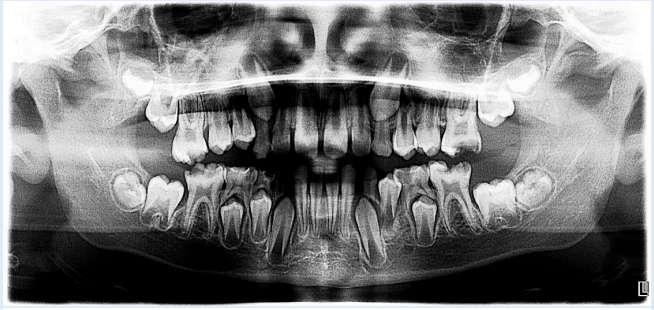
Severe caries on permanent first molars (PFMs) in school-aged children presents a unique clinical challenge for dental practitioners. Caries on PFMs can progress rapidly due to pre and post-eruptive changes to the integrity of the tooth structure. Alternatively, neurobehavioral considerations such as ADHD can present an added layer of complexity to the management of these cases. Second-molar-substitution allows clinicians to present parents with an alternative treatment option that can be superior to restorative treatment in severely carious PFMs. Scientific articles published in the AAPD support nitrous oxide sedation as the most widely used pharmacologic agent for behavior management of dental patients with ADHD. Additionally, studies show that successful space closure following extraction of permanent first molars is as high as 80-90 percent in the maxillary arch and 50 percent in the mandible.

Case Report

A 9 year old male presented to the MetroHealth Family Dentistry clinic in September 2022 with ADHD, poor oral hygiene, and a chief complaint of "Tooth pain on the right side". Upon clinical and radiographic examination, all PFMs exhibited grossly carious occlusal surfaces with caries approximating the pulp. Teeth #3, 14, 19, and 30 were diagnosed with reversible pulpitis and symptomatic apical periodontitis. Treatment options included: 1) Extraction, 2) RMGI composite, 3) Stainless Steel Crowns. Due to the patient's chronologic age, the presence of third molars, and the developmental stage of permanent second molars, a prognosis of good was given to option 1. A prognosis of fair to poor was given to options 2 and 3 with need for close follow-up and additional treatment likely required in the future. After consideration of all patient factors, four PFM extractions were recommended and accepted with the use of in-office nitrous oxide sedation. Extractions of teeth #3, 14, 19, 30 were performed using nitrous oxide sedation over 3 visits and 4 months. An updated panoramic radiograph was taken 18 months after the initial visit. Sealants were placed on the patient's newly erupted second permanent molars. Clinical photos were obtained and a referral to the orthodontist was made for evaluation.

Clinical Presentation

Radiographic Findings



Discussion

In order to properly manage cases of PFM extractions, a variety of clinical scenarios must be true to achieve successful space closure. In addition to chronologic age, the permanent second molar (PSM) Demirjian stage and the presence of the permanent third molars are both critical. For the maxillary arch, the recommended age to extract the PFM is age 8 and Demirjian stage D of the PSM tooth development. In the mandible, the ideal age for extraction is age 8-10 and Demirjian stage D or E. The disadvantages to be expected with PFM extractions if done outside of these parameters are as follows: increased spacing in both arches, mesial inclination of PSM's - more noticeably in the mandibular arch, supra-eruption of the opposing permanent molar if done in isolation, and the need for orthodontic intervention to achieve proper dental alignment. Upon presentation, our patient was of appropriate chronological age (9) for PFM extractions, stage D for teeth #2 and #15, stage E for teeth #18 and #31 and had all permanent third molars. Due to the presence of all these factors, a favorable outcome for second-molar substitution and proper space closure was anticipated. Our patient achieved more successful approximation in the maxilla than mandible, with slight mesial inclination in the mandibular arch. Despite this, treatment was determined successful by the family due to resolution of the patient's chief compliant, an improvement of oral hygiene and caries risk factors, and adequate room for orthodontic correction.

Demirjian Stages of PSM development

D

E

References

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2. Nordeen KA, Kharouf JG, Mabry TR, Dahlke WO, Beiraghi S, Tasca AW. Radiographic evaluation of permanent second molar substitution after extraction of permanent first molar: Identifying predictors for spontaneous space closure. Pediatr Dent 2022;44(2):123-9.E10