Primary Failure of Eruption: An Interesting Case Report

Leva Sabet-Sharghi DDS, Ying An DDS, PhD, Gerald Ferretti DDS, MS, MPH, Margaret Ferretti DMD, MPH

Department of Pediatric Dentistry, Rainbow Babies and Children's Hospital

Case Western Reserve University School of Dental Medicine

Introduction:

Monitoring a child's growth and development through the sequencing of tooth exfoliation and eruption is an important component of pediatric dentistry. With that role comes the responsibility of being able to identify anomalous presentations, and when to take a multidisciplinary approach to correctly diagnose and manage accordingly. This case presentation involves the identification and diagnosis of a unique presentation of primary failure of eruption (PFE). PFE is a rare, non-syndromic condition involving the partial or complete non-eruption of teeth in the absence of mechanical obstruction. Both primary and permanent teeth can be involved, with the posterior dentition being most affected. Typically, all teeth distal to the most mesial affected tooth present with the disorder. This disturbed eruption pattern often results in a posterior open bite, with the affected teeth being untreatable from an orthodontic standpoint. This case will review the identification, diagnosis, and future treatment implications of a 11-year-old male presenting with primary failure of eruption of the entire posterior dentition.

Clinical Presentation:

This 11 year old male was first seen for a comprehensive exam at the CWRU Pediatric clinic where a notable discrepancy between the patient's chronologic and dental age was noted, along with general asymmetry and malocclusion. After a thorough medical questionnaire, parents reported an unremarkable medical history but did indicate it was not until about age 3 until the patient started getting teeth in. From there, a panoramic image was obtained and the patient was then referred to the Craniofacial Orthodontic clinic where diagnostic imaging and photos were obtained. Upon clinical and radiographic examination, the patient presented with erupted B, C, D, 8, G, H, 21 (partial), 22, 23, 24, 25, and 26. The panoramic image shows a mix of both submerged primary and permanent teeth without ankylosis or mechanical obstruction. A pronounced convex profile, lip incompetence, posterior open bite, and anterior deep bite were also observed. As visualized on the lateral ceph, there is proclination of both the lower and upper incisors, with a slightly retrognathic mandible. The submergence of the entire posterior dentition with no associated syndromes or evidence of obstruction is highly suggestive of PFE, which has important implications on management and treatment moving forward for this patient.

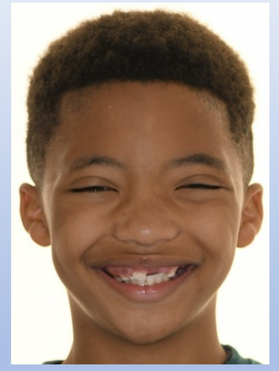
Discussion:

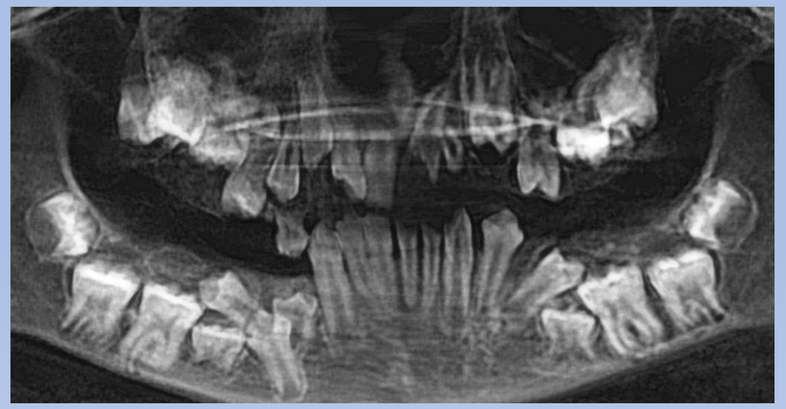
The first step in both diagnosis and treatment of this patient is genetic testing, which he is set to have done at Rainbow Babies and Children's Hospital this Spring. This will be to identify a suspected mutation in the PTH1R gene, which when combined with clinical findings, confirms a diagnosis of Primary Failure of Eruption. PTH1R is essential to tooth eruption through activation of the pathway that facilitates progression of tooth development and eruption. Without it's normal function, the entire eruptive mechanism of the affected dentition is at fault. This has important implications regarding the possibility of orthodontic treatment, as such forces are only successful when the eruptive mechanism is intact, and a mechanical obstruction is the cause of impaction. If the PFE mutation is not detected, or it is found that the anterior dentition is unaffected, the patient will return to the CWRU Craniofacial orthodontic team to initiate conventional orthodontic treatment. If PFE is confirmed by genetics, orthodontic treatment will be contraindicated, as it can worsen conditions through means of inducing ankylosis.

In addition to the complete failure of eruption seen with PFE, teeth may initially erupt through the gingiva and then fail to erupt further into occlusion. This can be appreciated in the clinical and radiographic photographs, and both contribute to the observed posterior open bite. This is a typical finding in those affected by PFE, that tends to increase with patient age despite normal vertical facial growth. The only feasible treatment option to achieve a proper esthetic and functional result through stable posterior occlusion is prosthetic rehabilitation, likely through the fabrication of partial dentures. Since this patient is still in the growth phase, definitive restorations cannot be considered until his vertical component has reached completion. As he continues to grow and mature, any progression in further root development or eruption of the posterior dentition will be monitored, and his prosthodontic interventions altered accordingly.

Conclusion:

Restoring function and esthetics through prosthetic treatment provides more benefit than just establishment of dental equilibrium. It also has positive impact on the emotional and social well-being of the patient. An anomaly such as this has significant repercussions towards the developing pediatric psyche in terms of quality of life and self-perception. It is important to assess such perceptions whilst setting realistic treatment expectations for both parents and children suffering from eruptive conditions such as PFE. There is a long road ahead prior to definitive treatment outcomes, but successful navigation through all phases can be achieved through collaborative interdisciplinary management.





References:

1. Elhag, S. B. I., & Abdulghani, A. S. I. (2015). Primary failure of eruption combined with bilateral transmigration of mandibular canines, transposition, torus palatinus, and class III incisor relationship: A rare case report. *European journal of dentistry*, *9*(4), 594–598. https://doi.org/10.4103/1305-7456.172628
2. Grippaudo, C., D'Apolito, I., Cafiero, C. *et al.* Validating clinical characteristics of primary failure of eruption (PFE) associated with *PTH1R* variants. *Prog Orthod.* **22**, 43 (2021). https://doi.org/10.1186/s40510-021-00387-z
3. Hanisch, M., Hanisch, L., Kleinheinz, J., & Jung, S. (2018). Primary failure of eruption (PFE): a systematic review. *Head & face medicine*, *14*(1), 5. https://doi.org/10.1186/s13005-018-0163-7
4. Jain, U., Kallury, A., Rao, D. D., & Bharti, H. V. (2015). Primary failure of eruption (PFE). *BMJ case reports*, *2015*, bcr2015209703. https://doi.org/10.1136/bcr-2015-209703
5. Yamaguchi, T., Hosomichi, K., Shirota, T., Miyamoto, Y., Ono, W., & Ono, N. (2022). Primary failure of tooth eruption: Etiology and management. *The Japanese dental science review*, *58*, 258–267. https://doi.org/10.1016/j.jdsr.2022.08.002