

Abstract

Failure of eruption of permanent molars in pediatric patients presents a diagnostic challenge with important implications for treatment planning. Primary failure of eruption (PFE) involves a defect in the eruption mechanism without a physical obstruction and may affect multiple teeth, whereas mechanical failure of eruption is typically localized and associated with factors such as ankylosis, abnormal angulation, or obstruction.

This case describes a 9-year-8-month-old female presenting with delayed eruption of maxillary right first molar (#3). Radiographic evaluation showed approximately two-thirds root development with minimal positional change and a localized radiopacity in the eruption path. Differential diagnosis included PFE versus mechanical obstruction, with concern for a complex odontoma.

Given the diagnostic uncertainty, a conservative approach was taken. The patient was referred to orthodontics, with consideration for CBCT imaging, and placed on 6-month recall for clinical and radiographic monitoring, including evaluation of adjacent teeth and possible root resorption of #4.

This case emphasizes the importance of distinguishing PFE from mechanical causes and supports conservative monitoring with multidisciplinary involvement in developing dentition.

Background

Tooth eruption is a complex biological process involving coordinated bone resorption and tooth movement into the oral cavity, and disturbances in this process can significantly impact occlusion and craniofacial development. Eruption disturbances may be classified as primary failure of eruption (PFE) or mechanical failure of eruption (MFE). PFE is a rare condition characterized by a generalized defect in the eruption mechanism affecting multiple posterior teeth and is often associated with genetic mutations; affected teeth typically do not respond to orthodontic forces. In contrast, MFE usually involves a single tooth and results from local factors such as ankylosis, physical obstruction, or abnormal angulation along the eruption path.

Clinically, failure of molar eruption is often asymptomatic and may be detected incidentally during routine examination or radiographic evaluation. Delayed diagnosis can lead to complications including malocclusion, space loss, and overeruption of opposing teeth, which may compromise long-term function and esthetics. Management depends on the underlying etiology and may include observation, surgical intervention, orthodontic treatment, or extraction with prosthetic replacement. Early identification and accurate differentiation between PFE and MFE are critical to guide appropriate treatment and improve outcomes in pediatric patients.

Clinical Presentation

A 9-year-8-month-old female presents to Mott Children's Health Center in Flint, MI for a routine dental examination.

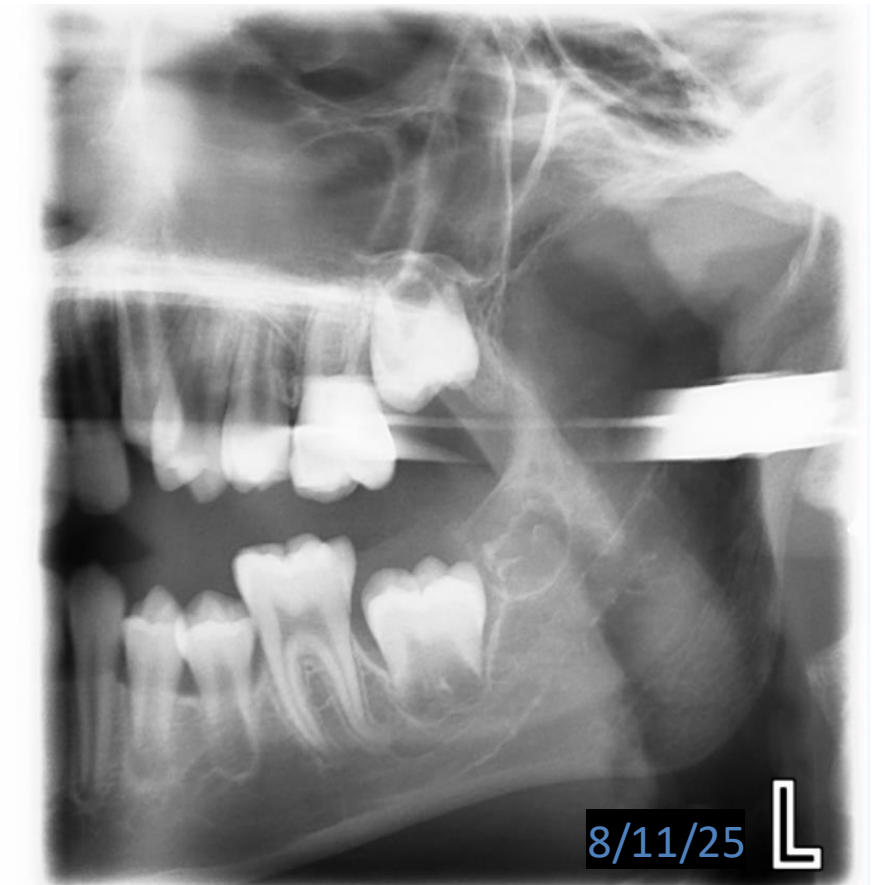
- **Chief concern:** "Here for a check-up". Mother has no dental concerns.
- **Medical history:** Hyperthyroidism, ADHD
- **Medications:** Methimazole, Qelbree
- **Allergies:** Fish

Clinical findings:

- Extraoral exam: within normal limits
- Soft Tissue Exam: Generalized mild gingivitis, otherwise, the rest is within normal limits
- Hard Tissue Exam:
 - Permanent dentition 6 to 6, minus tooth #3 that is still unerupted and not palpable.
 - No caries found.
- **Occlusion:** Class I molar occlusion on the left, and the molar occlusion is not possible to obtain on the right because #3 is unerupted. Space loss is noted on the LL and LR with generalized mild crowding.

Radiographic findings:

- Permanent dentition
- No radiographic caries
- Tooth #3 is unerupted with about 2/3 of root development. - Minimal positional change of #3 over time (stable occlusal plane relative to #2 on serial PANs)
- Localized radiopacity in the eruption path of #3 - suggestive of possible obstruction (e.g., complex odontoma vs bony sequestrum)
- Adjacent teeth #4 and #5 fully erupted. Monitor #4 for possible distal root resorption
- No generalized eruption disturbance



Discussion

This case presents a delayed eruption of maxillary right first molar (#3) with approximately two-thirds root development and minimal positional change over time. While initially diagnosed as primary failure of eruption (PFE), the presence of a radiopacity raises concern for a possible mechanical obstruction, such as a complex odontoma, which would instead indicate secondary failure of eruption. Distinguishing between these diagnoses is critical, as management and prognosis differ significantly.

The patient was referred to orthodontics for further evaluation, with potential oral surgery involvement depending on findings. Advanced imaging (CBCT) is recommended to better assess the radiopacity and eruption pathway of #3, as well as to monitor for distal root resorption of #4. The patient will continue 6-month recall with pediatric dentistry, with close monitoring of adjacent teeth (#2 and #1) for possible involvement. A multidisciplinary approach is essential to establish diagnosis and guide timely intervention.

References

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