Submitted: 09 February, 2026 Accepted: 05 June, 2026 Published: 03 September, 2026 DOI:10.22514/jocpd.2026.136

CASE REPORT

Journal of Clinical Pediatric Dentistry

# Timing of extraction of supplemental maxillary lateral incisors and eruption of the maxillary canine: a case series of four patients with CBCT evaluation

Ji Hyun Lee[1,†], Suji Lee[1,†], Jaesik Lee[1,*]

[1]Department of Pediatric Dentistry, School of Dentistry, Kyungpook National University, 41940 Daegu, Republic of Korea

***Correspondence**
leejs@knu.ac.kr
(Jaesik Lee)

[†] These authors contributed equally.

## Abstract

**Background**: Supplemental maxillary lateral incisors are relatively uncommon dental anomalies that may interfere with the normal eruption of the permanent maxillary canine. Although early extraction is frequently recommended, the optimal timing of intervention relative to canine root development remains unclear, particularly in situations where eruptive guidance is compromised. **Cases**: This descriptive case series presents four pediatric patients with impacted supplemental maxillary lateral incisors who underwent thorough clinical and radiographic evaluation using panoramic radiography and cone-beam computed tomography (CBCT) at various stages of maxillary canine root development. The main factors considered were the extraction timing of supplemental incisor extraction in relation to canine root formation, morphology of the lateral incisors, buccopalatal position of the supplemental tooth, and local space conditions. After extraction of the supplemental lateral incisors, spontaneous eruption of the maxillary canines occurred in three of the four cases. In one case, early extraction, combined with unfavorable local factors, was followed by ectopic eruption that necessitated surgical exposure and orthodontic traction. **Conclusions**: Within the limitations of this descriptive case series, extraction of supplemental maxillary lateral incisors after sufficient canine root development, corresponding to Nolla stages 6 to 8, may promote favorable eruption of the maxillary canine. The eruption outcome appears to depend not only on the timing of extraction but also on local anatomical and space-related factors. Comprehensive evaluation of these factors, including CBCT-based assessment when indicated, may help minimize the need for additional surgical or orthodontic intervention.

## Keywords

Supplemental lateral incisor; Maxillary canine; Eruption guidance; Extraction timing; Cone-beam computed tomography

## 1. Introduction

Supernumerary teeth are developmental anomalies defined by the presence of teeth in excess of the normal dental formula, most commonly observed in the maxillary anterior region during the mixed dentition period [1]. Among these, supernumerary lateral incisors are relatively rare, with reported prevalence ranging from 0.05% to 1.59%, depending on the population studied and showing notable variation across ethnic groups [2, 3]. While supernumerary teeth are frequently associated with syndromes, isolated occurrences in non-syndromic patients have also been reported. The supplemental type, in particular, closely resembles a normal lateral incisor in both size and morphology, which may render clinical diagnosis challenging [1, 4]. Because these teeth may erupt into the dental arch and appear morphologically normal, they can remain undetected during routine examinations, leading to underestimation of their potential impact on adjacent teeth [4]. Supplemental lateral incisors can interfere with normal eruption patterns, resulting in delayed eruption, ectopic eruption, or impaction of adjacent permanent teeth, most notably the maxillary canine [5–8]. Given the rarity of this condition and the clinical importance of early detection, evidence guiding timely intervention, including extraction, remains limited [2, 4].

Consequently, descriptive case series documenting treatment outcomes following the extraction of supplemental lateral incisors are of particular clinical significance in pediatric dentistry.

The maxillary canine is among the most complex teeth to erupt because of its prolonged eruption path and anatomical constraints. It is second only to the third molars in terms of impaction frequency and demonstrates a higher incidence of impaction in females than in males. The timing and trajectory of canine eruption are highly dependent on the surrounding anatomical structures, particularly the lateral incisor, which plays an essential role in guiding the erupting canine [4, 7].

When this guidance mechanism is disrupted by developmental anomalies, such as peg-shaped lateral incisors or agenesis, or when mechanical obstruction occurs due to supernumerary teeth, the canine may deviate from its normal path, resulting in ectopic eruption, palatal displacement, rotation, or complete impaction.

According to the guidance theory, the distal surface of the lateral incisor root directs the eruption path of the maxillary canine [4, 5, 7]. When the lateral incisor is absent or morphologically abnormal, normal canine eruption may be compromised. In cases involving supplemental lateral incisors, canine displacement or impaction can arise from a combination of factors, including compromised eruptive guidance, mechanical obstruction, and insufficient arch space [4, 6, 7]. This risk is further increased when the adjacent lateral incisor is peg-shaped or congenitally absent. Although the guidance theory is widely cited as a potential explanation, a genetic predisposition has also been proposed. Palatally displaced canines are frequently associated with other dental anomalies, suggesting a broader developmental disturbance rather than an isolated guidance defect [9, 10].

The timing of supplemental maxillary lateral incisor extraction may be a critical determinant of spontaneous maxillary canine eruption [7, 11]. Observational analyses indicate that naturally erupting maxillary canines often emerge before root formation is complete, corresponding to Nolla stages 6 to 9 during the late mixed dentition period [12, 13]. Intervention within this developmental window may help preserve eruptive potential once normal guidance is restored. Conversely, premature extraction performed before sufficient canine root formation may reduce eruptive force and prevent spontaneous eruption, whereas delayed extraction increases the likelihood of complete canine impaction, frequently necessitating surgical exposure and orthodontic traction [14].

Advanced imaging modalities, particularly cone-beam computed tomography (CBCT), provide precise three-dimensional (3D) evaluation of tooth position, root development, and spatial relationships between the canine and adjacent teeth [15, 16]. CBCT has therefore become an indispensable diagnostic tool for treatment planning in cases involving supernumerary teeth and canine eruption disturbances [15, 16]. In this case series, we present four pediatric patients with supplemental lateral incisors and evaluate maxillary canine eruption outcomes following extraction, with particular emphasis on the timing of intervention and its influence on spontaneous eruption. Both CBCT-based assessment of tooth position and spatial relationships and panoramic evaluation of root development were utilized to inform clinical decision-making.

## 2. Study design and methods

This retrospective case series was approved by the Institutional Review Board of Kyungpook National University Dental Hospital (protocol no. KNUDH-2026-02-03-00). Written informed consent was obtained from the patients' parents or legal guardians, and all patient information was anonymized before analysis. Pediatric patients presenting with supplemental maxillary lateral incisors who visited Kyungpook National University Dental Hospital between January 2017, and January 2024 were screened for inclusion. Patients with syndromic conditions or cleft lip and/or palate that could affect tooth eruption, as well as those with incomplete records or insufficient follow-up, were excluded [3]. After application of these criteria, 23 patients were identified during the study period. Of these, 19 were excluded due to eruption of both lateral incisors, incomplete records, or inadequate follow-up, leaving four eligible cases for inclusion in the final analysis.

The following parameters were collected from the patients' electronic medical records, panoramic radiographs, and CBCT images: age, sex, morphology and position of the supplemental lateral incisor, position of the maxillary canine, timing of extraction, any additional interventions, and eruption outcomes. All data were reviewed by a single dentist. Maxillary permanent canine root development was assessed on panoramic radiographs using the Nolla staging system. To minimize variability, all panoramic radiographs were acquired using the same imaging modality and panoramic machine. Before formal assessment, two investigators underwent calibration and training for Nolla stage scoring. Inter-rater agreement was determined using weighted Cohen's kappa coefficient, yielding a value of 0.94. Formal scoring was then performed independently by both examiners, and any disagreements were resolved by consensus.

CBCT imaging was obtained selectively, only when additional 3D information was deemed necessary for diagnosis or treatment planning. In this series, all included cases involved impacted supplemental maxillary lateral incisors, which could act as physical obstructions to the canine eruption path, making accurate 3D localization essential for surgical planning. CBCT was therefore prescribed when the buccopalatal relationship could not be clearly determined on conventional radiographs, and only when the expected diagnostic benefit outweighed the radiation exposure in pediatric patients. CBCT scans were acquired using the HDXWILL EcoX-ai (HDXWILL, Seoul, Korea) with the following parameters: 85 kVp, 6 mA, 24-second exposure time, 16 × 9 cm field of view, and voxel size of 0.20 mm. Image datasets were reviewed using the hospital INFINITT Picture Archiving and Communication System (PACS) software (version G3 30116 BN2, Infinitt Co., Ltd., Seoul, Korea). A thyroid shield with a thickness equivalent to 0.25 mm lead was placed around the patient's neck before CBCT scanning to minimize radiation exposure.

Spontaneous eruption was defined as the eruption of the maxillary permanent canine after extraction of the supplemental lateral incisor without any additional surgical or orthodontic intervention during follow-up. The interval from extraction to eruption was recorded for each individual case. Canine position was primarily assessed on CBCT images based on location, displacement, and spatial overlap with the adjacent lateral incisor, and categorized as favorable or unfavorable for eruption. Panoramic radiography was used complementarily to evaluate the overall eruption trajectory and root development stage. Space conditions were assessed qualitatively by a single dentist based on clinical and radiographic findings. Adequate space was defined as sufficient room to accommodate normal canine eruption, whereas space loss indicated a reduction in available space likely to interfere with the eruptive pathway.

## 3. Case presentations

### 3.1 Case 1

A 4-year-old boy presented with the chief complaint of an extra tooth in the maxillary anterior region. Initial radiographic examination confirmed the presence of two lateral incisor tooth germs in the area corresponding to the right maxillary lateral incisor. Given the patient's young age and the absence of acute symptoms, a strategy of periodic observation was adopted.

During follow-up, the mesial lateral incisor erupted into the oral cavity in a normal position, whereas the distal lateral incisor remained impacted. After 4 years of follow-up, preoperative panoramic radiography demonstrated the impacted supplemental lateral incisor in the region of the right maxillary lateral incisor (#12), and the adjacent maxillary canine had reached Nolla stage 7 (Fig. 1A). CBCT imaging was additionally performed to evaluate the positional relationship between the impacted distal lateral incisor and the adjacent maxillary canine (Fig. 1B,C). The canine was approaching its expected eruption phase, and its position was assessed as favorable. Consequently, the impacted distal lateral incisor was surgically extracted under local anesthesia in an outpatient setting to prevent interference with normal eruption.

At 14 months after extraction, the right maxillary canine was progressing along a favorable eruption path without the need for any additional surgical or orthodontic intervention (Fig. 1D).

### 3.2 Case 2

An 8-year-old girl was referred for evaluation of delayed eruption of the maxillary right lateral incisor. Her dental history included extraction of the maxillary right primary lateral incisor at another clinic approximately 8 months prior; however, the permanent lateral incisor had not yet erupted. Radiographic examination at the time of referral revealed a supplemental tooth in the maxillary anterior region.

Clinical and radiographic assessment, including panoramic radiography and CBCT, demonstrated delayed eruption of both the maxillary right lateral incisor and canine relative to the contralateral side. At the time of extraction, the root of the maxillary canine had reached Nolla stage 8. CBCT imaging revealed that both the maxillary permanent canine and the supplemental lateral incisor were positioned buccally, with the supplemental tooth adjacent to the permanent lateral incisor, and both teeth exhibited peg-shaped morphology (Fig. 2A–C). To eliminate eruptive interference and facilitate normal eruption, the distal supplemental lateral incisor was extracted under local anesthesia in an outpatient setting.

At 6 months after extraction, the remaining lateral incisor had erupted into a favorable position, and the maxillary right canine was progressing along a favorable eruption path without additional surgical or orthodontic intervention (Fig. 2D).

### 3.3 Case 3

A 3-year-old boy presented for a routine oral examination. Intraoral evaluation revealed a primary supplemental lateral incisor in the maxillary right incisor region. Panoramic and periapical radiographs demonstrated duplication of both the primary and permanent maxillary right lateral incisors, all exhibiting normal crown morphology and size (Fig. 3A,B). A paramolar was also identified in the maxillary right posterior region and was subsequently removed during follow-up, as it was considered a potential obstacle to normal eruption.

The patient was monitored periodically. At 6 years and 10 months of age, panoramic radiography indicated that the maxillary right canine had reached Nolla stage 6. CBCT imaging was performed to evaluate the precise positional relationship of the involved teeth (Fig. 3C). The primary lateral incisor and the distal permanent supplemental lateral incisor in the maxillary right incisor region were extracted simultaneously under local anesthesia in an outpatient setting to eliminate eruptive interference.

At 21 months after extraction, the maxillary right canine was progressing along a favorable eruption path without additional surgical or orthodontic intervention (Fig. 3D).

### 3.4 Case 4

A 7-year-old boy was referred following identification of an additional anterior tooth and absence of a posterior tooth in the maxillary arch. Panoramic radiography revealed a supplemental lateral incisor adjacent to the maxillary left permanent lateral incisor, with both teeth exhibiting peg-shaped morphology. Congenital absence of the maxillary left second premolar (#25) and multiple carious lesions in the maxillary primary molars were also noted (Fig. 4A).

Given the patient's age, limited cooperation, and the need for comprehensive dental management, treatment was planned under general anesthesia. At 7 years and 3 months of age, panoramic radiography indicated that the maxillary left canine had reached Nolla stage 6, and CBCT was performed to assess the positional relationship of the involved teeth (Fig. 4B). Under general anesthesia, comprehensive caries treatment was completed, and the distal supplemental lateral incisor was extracted to eliminate eruptive interference.

At 18 months after extraction, panoramic radiography revealed ectopic displacement of the maxillary left canine, accompanied by mild follicular enlargement in the periapical region of the displaced canine (Fig. 4C). Surgical exposure was performed, and orthodontic traction was initiated. A postoperative panoramic radiograph obtained 51 months after extraction demonstrated the left maxillary canine undergoing orthodontic traction (Fig. 4D). Three-dimensional reconstruction performed before and after extraction further illustrated the positional change of the left maxillary canine and eruption of the retained lateral incisor (Fig. 5A,B).

## 4. Discussion

### 4.1 Timing of extraction and canine root development

As summarized in Table 1, three of the 4 patients in this series exhibited spontaneous eruption of the maxillary canine following extraction of the supplemental lateral incisor, whereas one patient (Case 4) experienced ectopic eruption requiring surgical exposure and orthodontic traction. These

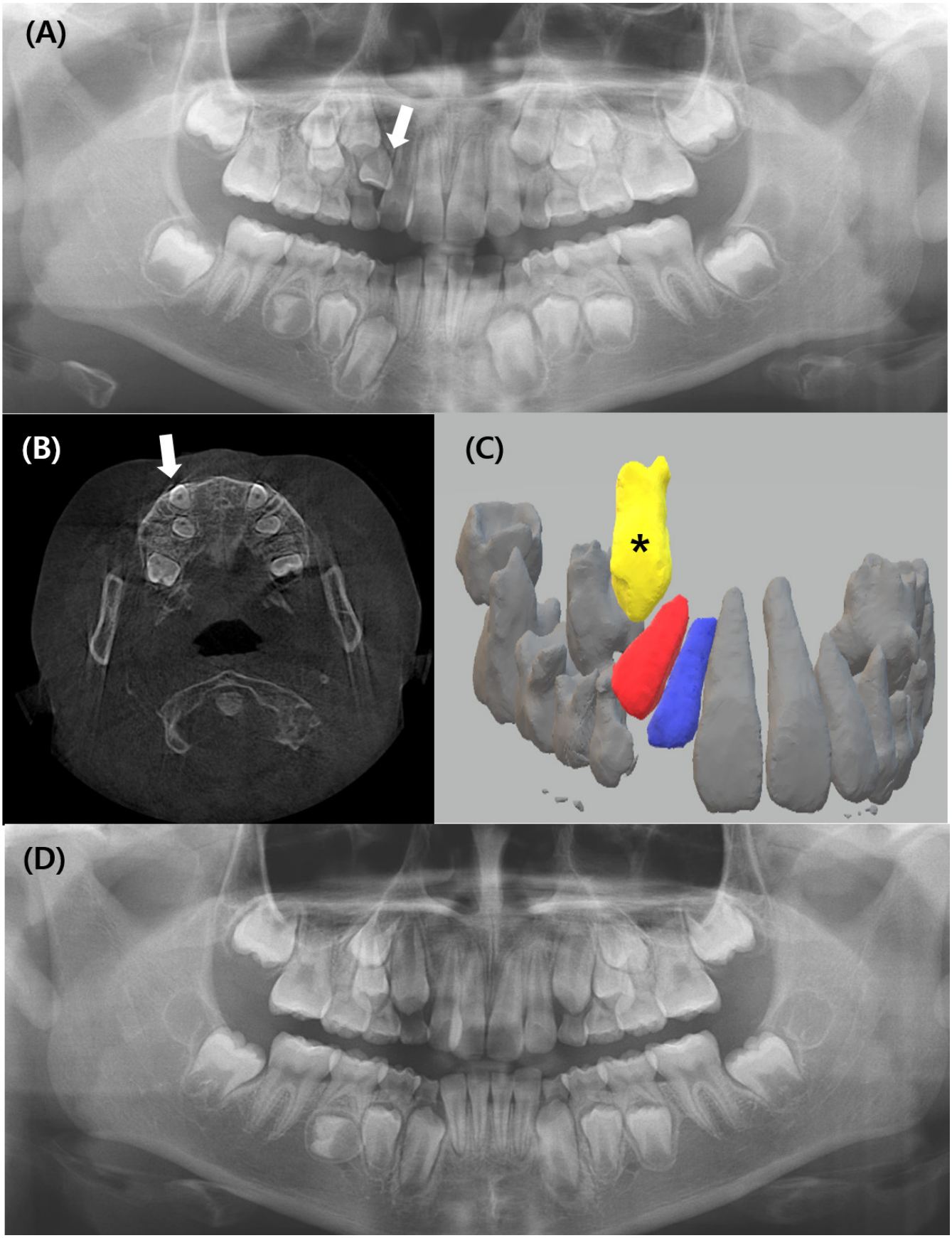


**FIGURE 1. Radiographic findings of Case 1.** (A) Preoperative panoramic radiograph showing the impacted supplemental maxillary lateral incisor (arrow). (B) Preoperative axial CBCT image depicting the buccal position of the maxillary canine (arrow). (C) Preoperative 3D reconstruction illustrating the spatial relationship among the maxillary canine (yellow, asterisk), the supplemental lateral incisor planned for extraction (red), and the retained lateral incisor (blue). (D) Postoperative panoramic radiograph showing the canine progressing along a favorable eruption path.

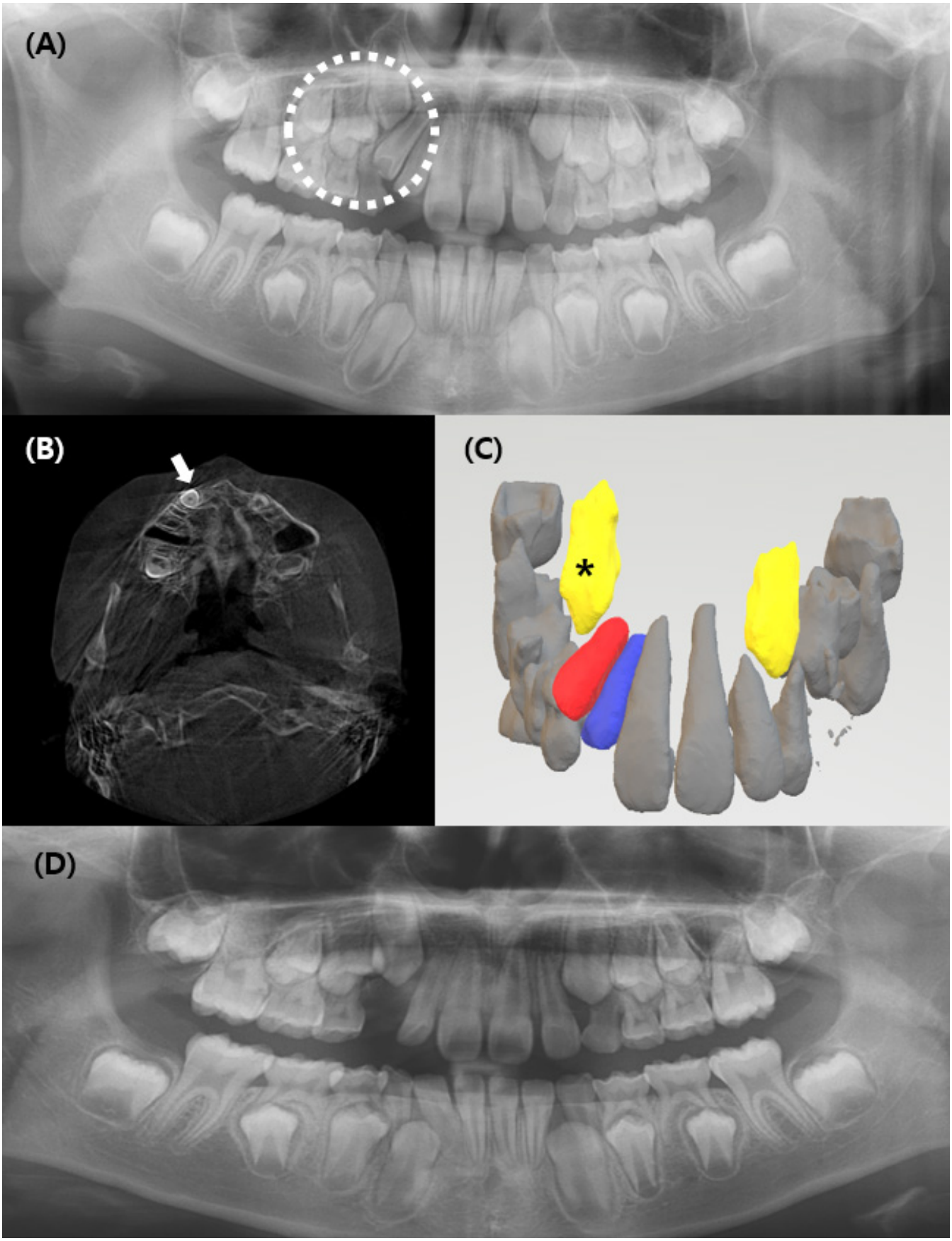


**FIGURE 2. Radiographic findings of Case 2.** (A) Preoperative panoramic radiograph showing a peg-shaped supplemental maxillary lateral incisor (circle). (B) Preoperative axial CBCT image illustrating the buccal position of the maxillary canine (arrow). (C) Preoperative 3D reconstruction showing the spatial relationship among the maxillary canine (yellow, asterisk), the supplemental lateral incisor planned for extraction (red), and the retained lateral incisor (blue). (D) Postoperative panoramic radiograph demonstrating eruption of the lateral incisor and the canine progressing along a favorable eruption path.

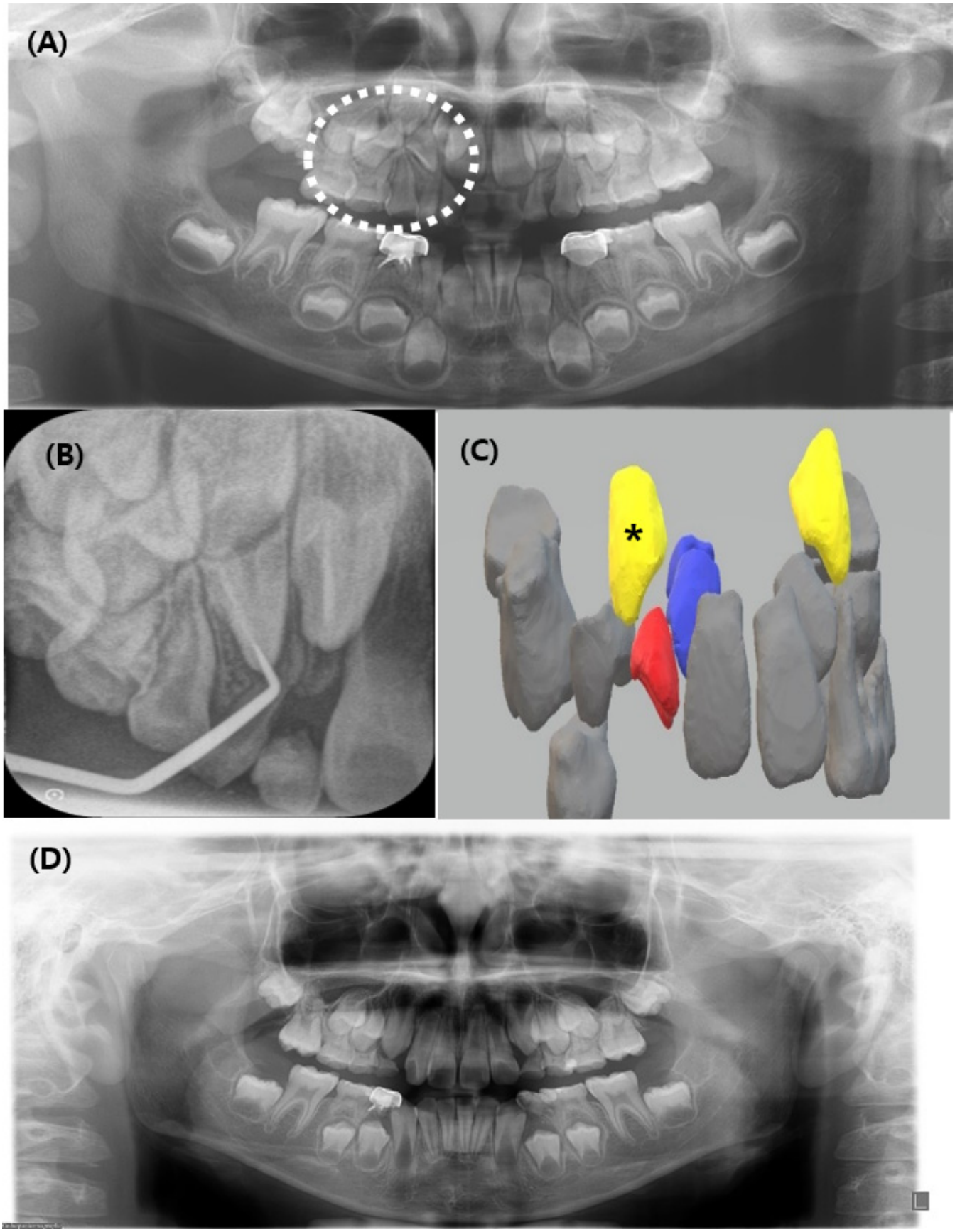


**FIGURE 3. Radiographic findings of Case 3.** (A) Initial panoramic radiograph showing duplication of the primary and permanent maxillary lateral incisors (circle). (B) Preoperative periapical radiograph demonstrating the right permanent supplemental lateral incisor. (C) Preoperative 3D reconstruction illustrating the spatial relationship among the maxillary canine (yellow, asterisk), the supplemental lateral incisor planned for extraction (red), and the retained lateral incisor (blue). (D) Postoperative panoramic radiograph showing the canine progressing along a favorable eruption path.

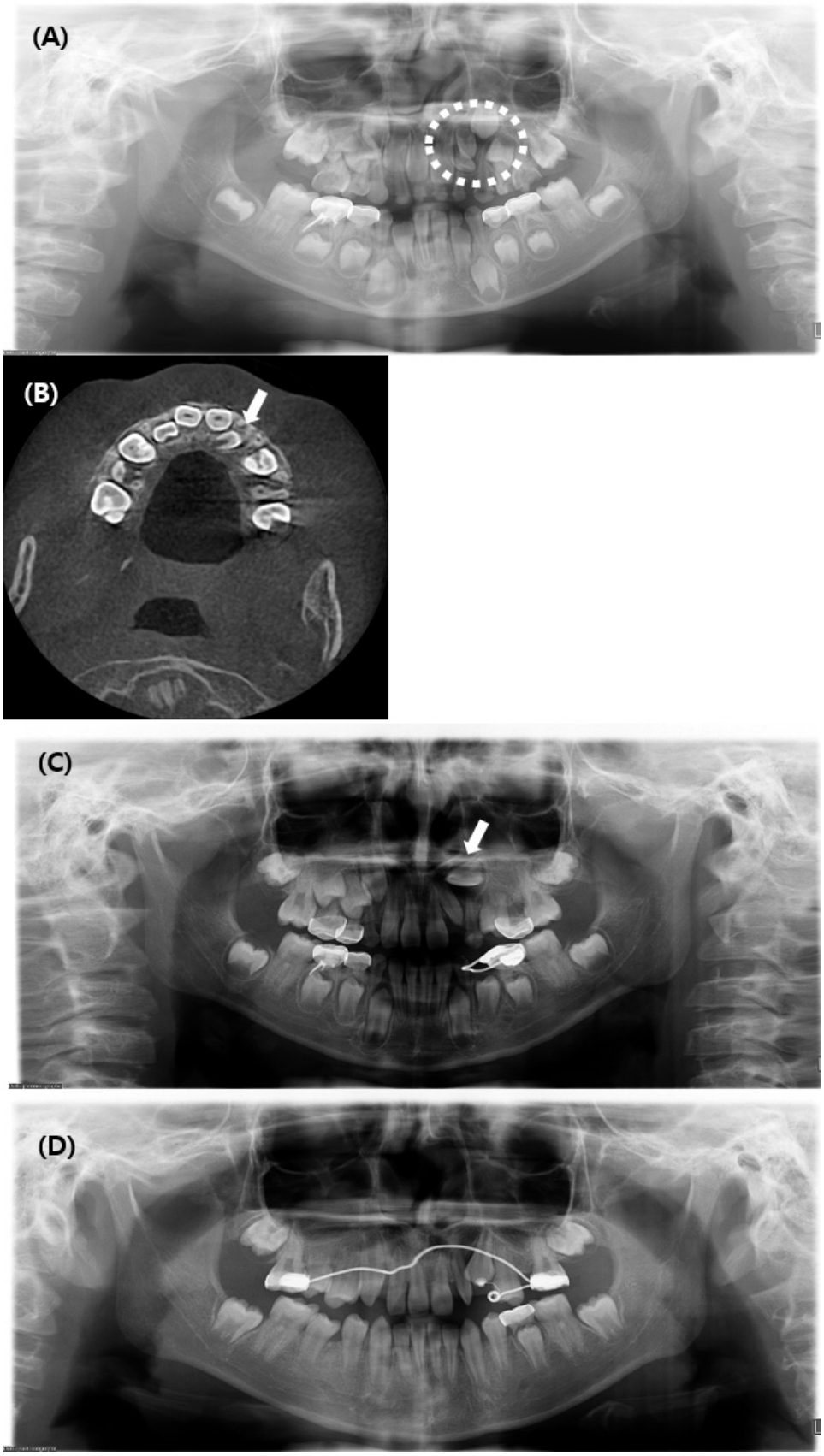


**FIGURE 4. Radiographic findings of Case 4.** (A) Initial panoramic radiograph showing a left maxillary supplemental lateral incisor (circle), multiple carious lesions in primary molars, and congenital absence of the left maxillary second premolar. (B) Preoperative axial CBCT image illustrating palatal displacement of the left maxillary canine (arrow). (C) Postoperative panoramic radiograph obtained 18 months after extraction, showing ectopic displacement of the left maxillary canine (arrow). (D) Postoperative panoramic radiograph obtained 51 months after extraction, showing orthodontic traction of the left maxillary canine.

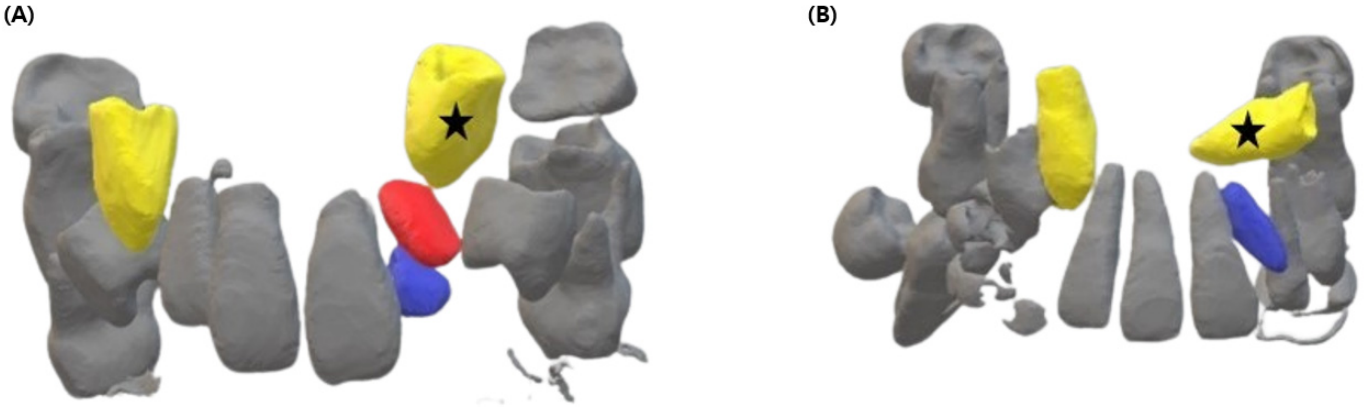


**FIGURE 5. 3D reconstruction of Case 4.** (A) Preoperative 3D reconstruction showing the position of the left maxillary canine (yellow, asterisk) relative to the supplemental lateral incisor to be extracted (red) and the retained lateral incisor (blue). (B) Postoperative 3D reconstruction illustrating ectopic displacement of the left maxillary canine (yellow, asterisk) and clinical eruption of the retained lateral incisor (blue).

**TABLE 1. Summary of clinical, radiographic, and treatment characteristics of four pediatric patients with supplemental maxillary lateral incisors.**

| Variables | Case 1 | Case 2 | Case 3 | Case 4 |
|---|---|---|---|---|
| Sex | Male | Female | Male | Male |
| Age at first examination (yr) | 4 | 8 | 3 | 7 |
| Side | Right | Right | Right | Left |
| Morphology of supplemental lateral incisor | Normal | Peg-shaped | Normal | Peg-shaped |
| Position of supplemental lateral incisor | Buccal | Buccal | Buccal | Palatal |
| Canine root development at supplemental lateral incisor extraction (Nolla stage)* | 7 | 8 | 6 | 6 |
| Canine position | Favorable | Favorable | Favorable | Unfavorable (palatally displaced) |
| Age of extraction (yr) | 9 | 8 | 6 | 7 |
| Follow-up duration after extraction | 14 mon | 6 mon | 21 mon | 51 mon |
| Canine outcome | Spontaneous eruption | Spontaneous eruption | Spontaneous eruption | Ectopic eruption requiring surgical exposure and orthodontic traction; orthodontic treatment ongoing |

**Root development stages were assessed according to the Nolla staging system.*

findings suggest that eruption disturbances associated with supplemental maxillary lateral incisors are multifactorial and that effective treatment planning should integrate both developmental timing and local anatomical considerations.

The timing of extraction appears closely linked to eruption outcome, particularly with respect to canine root development. The stage of canine root formation is widely recognized as a clinical indicator of eruption potential. Previous studies have reported that natural eruption of the maxillary canine commonly occurs before completion of root formation, corresponding to Nolla stages 6 to 9 during the late mixed dentition. Eruption becomes increasingly predictable as root development progresses within this range [12, 13]. During this phase, the eruptive pathway of the canine is thought to become progressively established in coordination with root formation.

In the present series, Cases 1 and 2 underwent extraction of the supplemental lateral incisor when the maxillary canine had reached Nolla stages 7 and 8, respectively, indicating that approximately half of the canine root had formed. In both instances, spontaneous eruption of the canine occurred. These observations suggest that removal of the eruptive obstacle after the eruption trajectory has been established may allow the canine to progress along its predetermined path. This aligns with prior reports. Yildirim and Bayrak described a case in which extraction of a supplemental permanent maxillary lateral incisor during the mixed dentition period, after sufficient canine root development, resulted in spontaneous eruption of the maxillary canine [6]. Similarly, other case reports have indicated that timely extraction of supplemental lateral incisors, after the adjacent permanent teeth have commenced root development, may facilitate favorable eruption of the maxillary canine without the need for additional orthodontic

intervention [17].

Conversely, extraction performed before adequate root formation may increase the risk of ectopic eruption. In the early stages of root formation, the eruptive direction of the canine is not yet fully established, and the absence of a normally developed lateral incisor root may deprive the canine of essential eruptive guidance [5]. In Case 4, extraction was performed when the maxillary canine was at Nolla stage 6, with less than one-third of the root formed. This was followed by palatal displacement and rotation of the canine, ultimately necessitating surgical exposure and orthodontic traction. These findings suggest that early extraction, before a stable eruptive trajectory has been established, may predispose to ectopic eruption, particularly in the presence of other unfavorable local factors.

Taken together, previous reports and the present cases indicate that extraction of supplemental lateral incisors after sufficient canine root development may be associated with a lower risk of ectopic eruption. Conversely, premature intervention, before adequate root formation, may place the canine at greater risk of displacement and require subsequent surgical or orthodontic management.

## 4.2 Role of lateral incisor morphology and position

Morphological anomalies of adjacent lateral incisors have been consistently reported as important contributors to failure of eruptive guidance of the maxillary canine. Brin *et al.* [18] reported that peg-shaped maxillary lateral incisors are significantly associated with palatal displacement and impaction of the maxillary canine, suggesting that reduced crown width and altered root morphology may impair the normal guidance mechanism required for canine eruption. Becker *et al.* [4] further emphasized that anomalous lateral incisors, including peg-shaped forms, may fail to provide adequate eruptive guidance, thereby increasing the likelihood of ectopic eruption of the adjacent canine. The absence and abnormal morphology of the lateral incisor are associated with an elevated risk of palatal displacement and impaction of the maxillary canine [8, 19]. These findings support the concept that morphological deviation of the lateral incisor may alter the spatial relationship and directional guidance of the erupting canine. Peck *et al.* [9] additionally proposed that palatally displaced canines associated with peg-shaped lateral incisors may reflect an underlying genetic or developmental predisposition, reinforcing lateral incisor morphology as a local risk indicator rather than a coincidental finding. In the present series, the co-occurrence of palatal canine displacement and premolar agenesis in Case 4 suggests that this case may reflect a broader developmental disturbance, indicating that the unfavorable eruption outcome cannot be attributed to extraction timing alone. By contrast, the favorable outcomes observed in Cases 1, 2, and 3 align more closely with the influence of extraction timing relative to canine root development.

In the present series, peg-shaped lateral incisors were observed in both Cases 2 and 4. However, the eruption outcomes differed between the two cases. In Case 2, spontaneous eruption occurred after extraction despite the presence of a peg-shaped lateral incisor, whereas in Case 4, the canine exhibited ectopic eruption requiring surgical exposure and orthodontic traction. This difference suggests that lateral incisor morphology alone may not determine eruption outcome and should be interpreted together with other local factors, such as buccopalatal position, extraction timing, and space conditions.

## 4.3 Contribution of CBCT and local anatomical factors

CBCT provides clinically valuable 3D information that extends beyond what can be obtained from panoramic radiography. It is particularly useful for evaluating buccopalatal position, crown angulation, and spatial overlap between the maxillary canine and the supplemental lateral incisor, relationships that cannot be fully appreciated on conventional two-dimensional radiographs. In the present series, CBCT was performed preoperatively to enable precise localization of the impacted supplemental lateral incisor relative to the adjacent maxillary canine and to minimize unnecessary bone removal. However, because CBCT involves radiation exposure, its use in pediatric patients should be carefully justified in accordance with the As Low As Reasonably Achievable (ALARA) principle and reserved for cases in which conventional radiography does not provide sufficient diagnostic information.

Previous studies have suggested that the position of lateral incisor anomalies relative to the canine eruption pathway may influence the likelihood of favorable eruption [9, 18, 19]. In the present series, Case 4 demonstrated both a palatally displaced maxillary canine and a palatally positioned supplemental lateral incisor on CBCT, followed by an unfavorable eruption course requiring surgical exposure and orthodontic traction. In contrast, Case 2 showed a buccally positioned supplemental lateral incisor with limited overlap with the canine, and spontaneous eruption occurred after extraction without additional intervention. These observations indicate that CBCT-based evaluation of buccopalatal position and spatial overlap may help identify cases at higher risk of eruption disturbance [15, 16].

Adequate space after extraction is generally considered important for spontaneous eruption of the maxillary canine. In the present series, space loss was associated with an unfavorable eruption course in Case 4, whereas preservation of space in the remaining cases was accompanied by spontaneous eruption. The possibility of concurrent follicular enlargement contributing to eruption difficulty in Case 4 also cannot be excluded. This finding aligns with previous observations indicating that spontaneous space recovery is uncommon without intervention [11].

Although multiple supernumerary teeth have been reported in association with certain systemic or genetic conditions, no such abnormalities were observed in the present case series, and all patients were considered non-syndromic.

## 4.4 Limitations

The present study had several limitations. The retrospective case series comprises a very small sample size (n = 4) from a single institution, which may limit the generalizability of the findings. Second, no comparison group was included,

which limits causal interpretation of the relationship between extraction timing and eruption outcome. Third, space conditions were assessed qualitatively rather than using standardized quantitative arch length analysis. In Case 4, which involved congenital absence of the maxillary left premolar, comprehensive orthodontic treatment is planned following complete transition to the permanent dentition. Finally, although CBCT provided useful 3D information, its use in pediatric patients requires careful justification due to radiation exposure.

The clinical management of Case 4 warrants particular discussion. Extraction of the primary canine as an interceptive measure was not performed, which may have contributed to the unfavorable eruption outcome and represents a limitation of this case. Regarding the primary molar, retention with a pediatric crown was preferred over pulp treatment in the context of congenital absence of the permanent successor (#25), as pulp treatment may accelerate physiological root resorption and lead to premature tooth loss.

### 4.5 Clinical implications

Early radiographic screening is important in children when an additional tooth is suspected in the maxillary anterior region. Delaying extraction of a supplemental maxillary lateral incisor until the adjacent canine has reached approximately Nolla stages 6 to 8 may allow the canine to establish a more stable eruption pathway. Careful evaluation of lateral incisor morphology, the buccopalatal position of the supplemental tooth, and local space conditions are essential, as these factors may influence eruption outcome. When conventional radiographs are insufficient to determine the positional relationship between the supplemental lateral incisor and the adjacent maxillary canine, CBCT can provide valuable 3D information for individualized treatment planning, provided that radiation exposure is carefully considered in pediatric patients.

## 5. Conclusions

Within the limitations of this small retrospective case series, extraction of supplemental maxillary lateral incisors during the late mixed dentition, after adequate root development of the maxillary canine (corresponding to approximately Nolla stages 6 to 8), was followed by spontaneous eruption in three of four pediatric patients. In contrast, early extraction at an initial stage of root formation, combined with unfavorable local factors such as palatal displacement of the canine, peg-shaped lateral incisors, and space loss, was associated with ectopic eruption requiring surgical exposure and orthodontic traction. These findings support the hypothesis that extraction timing relative to canine root development, together with lateral incisor morphology, buccopalatal position, and arch space conditions, may influence eruption outcome, although no causal inference can be drawn from this small retrospective series. CBCT-based 3D assessment provided valuable information on spatial relationships, complementing conventional panoramic imaging and supporting individualized treatment planning. Larger prospective studies are warranted to confirm these preliminary findings and to refine clinical guidelines for the management of supplemental maxillary lateral incisors in growing patients.

### ABBREVIATIONS

CBCT, cone-beam computed tomography; ALARA, As Low As Reasonably Achievable; 3D, three-dimensional; PACS, Picture Archiving and Communication System.

### AVAILABILITY OF DATA AND MATERIALS

All data generated or analyzed during this study are included in this published article.

### AUTHOR CONTRIBUTIONS

JHL—designed the research study. JHL and SJL—collected the clinical data and drafted the manuscript. JSL—critically revised the manuscript. All authors contributed to editorial revisions and approved the final version of the manuscript.

### ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This retrospective case series was approved by the Institutional Review Board of Kyungpook National University Dental Hospital (protocol no. KNUDH-2026-02-03-00). Written informed consent was obtained from the patients' parents or legal guardians, and all patient information was anonymized before analysis.

### ACKNOWLEDGMENT

Not applicable.

### FUNDING

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

### REFERENCES

[1] Primosch RE. Anterior supernumerary teeth—assessment and surgical intervention in children. Pediatric Dentistry. 1981; 3: 204–215.

[2] Chalakkal P, Krishnan R, De Souza N, Da Costa GC. A rare occurrence of supplementary maxillary lateral incisors and a detailed review on supernumerary teeth. Journal of Oral and Maxillofacial Pathology. 2018; 22: 149.

[3] Arandi NZ. Supernumerary lateral incisors: a narrative review. Journal of International Oral Health. 2020; 12: 299–304.

[4] Becker A. Orthodontic treatment of impacted teeth. 1st edn. Martin Dunitz: London. 1998.

[5] Jena AK, Duggal R. The pattern of maxillary canine impaction in relation to anomalous lateral incisors. Journal of Clinical Pediatric Dentistry. 2010; 35: 37–40.

[6] Yildirim G, Bayrak S. Early diagnosis of bilateral supplemental primary

and permanent maxillary lateral incisors: a case report. European Journal of Dentistry. 2011; 5: 215–219.

[7] Ericson S, Kurol J. Radiographic examination of ectopically erupting maxillary canines. American Journal of Orthodontics and Dentofacial Orthopedics. 1987; 91: 483–492.

[8] Becker A, Smith P, Behar R. The incidence of anomalous maxillary lateral incisors in relation to palatally-displaced cuspids. The Angle Orthodontist. 1981; 51: 24–29.

[9] Peck S, Peck L, Kataja M. The palatally displaced canine as a dental anomaly of genetic origin. The Angle Orthodontist. 1994; 64: 249–256.

[10] Pirinen S, Arte S, Apajalahti S. Palatal displacement of canine is genetic and related to congenital absence of teeth. Journal of Dental Research. 1996; 75: 1742–1746.

[11] Power SM, Short MB. An investigation into the response of palatally displaced canines to the removal of deciduous canines and an assessment of factors contributing to favourable eruption. British Journal of Orthodontics. 1993; 20: 215–223.

[12] Ristaniemi J, Rajala W, Karjalainen T, Melaluoto E, Iivari J, Pesonen P, *et al*. Eruption pattern of the maxillary canines: features of natural eruption seen in PTG at the late mixed stage—part I. European Archives of Paediatric Dentistry. 2022; 23: 223–232.

[13] Nolla CM. The development of permanent teeth [doctoral dissertation]. Ann Arbor: University of Michigan. 1952.

[14] Ericson S, Kurol J. Longitudinal study and analysis of clinical supervision of maxillary canine eruption. Community Dentistry and Oral Epidemiology. 1986; 14: 172–176.

[15] Alqerban A, Jacobs R, Fieuws S, Willems G. Comparison of two cone beam computed tomographic systems versus panoramic imaging for localization of impacted maxillary canines and detection of root resorption. European Journal of Orthodontics. 2011; 33: 93–102.

[16] Botticelli S, Verna C, Cattaneo PM, Heidmann J, Melsen B. Two-versus three-dimensional imaging in subjects with unerupted maxillary canines. European Journal of Orthodontics. 2011; 33: 344–349.

[17] Andrei OC, Farcaşiu C, Mărgărit R, Dinescu MI, Tănăsescu LA, Dăguci L, *et al*. Unilateral supplemental maxillary lateral incisor: report of three rare cases and literature review. Romanian Journal of Morphology and Embryology. 2019; 60: 947–953.

[18] Brin I, Becker A, Shalhav M. Position of the maxillary permanent canine in relation to anomalous or missing lateral incisors: a population study. European Journal of Orthodontics. 1986; 8: 12–16.

[19] Becker A, Chaushu S. Etiology of maxillary canine impaction: a review. American Journal of Orthodontics and Dentofacial Orthopedics. 2015; 148: 557–567.

**How to cite this article:** Ji Hyun Lee, Suji Lee, Jaesik Lee. Timing of extraction of supplemental maxillary lateral incisors and eruption of the maxillary canine: a case series of four patients with CBCT evaluation. Journal of Clinical Pediatric Dentistry. 2026; 50(5): 287-297. doi: 10.22514/jocpd.2026.136.