

# Association between Eruption Disturbance of the First Permanent Molar and Dentoskeletal Characteristics in Korean Children



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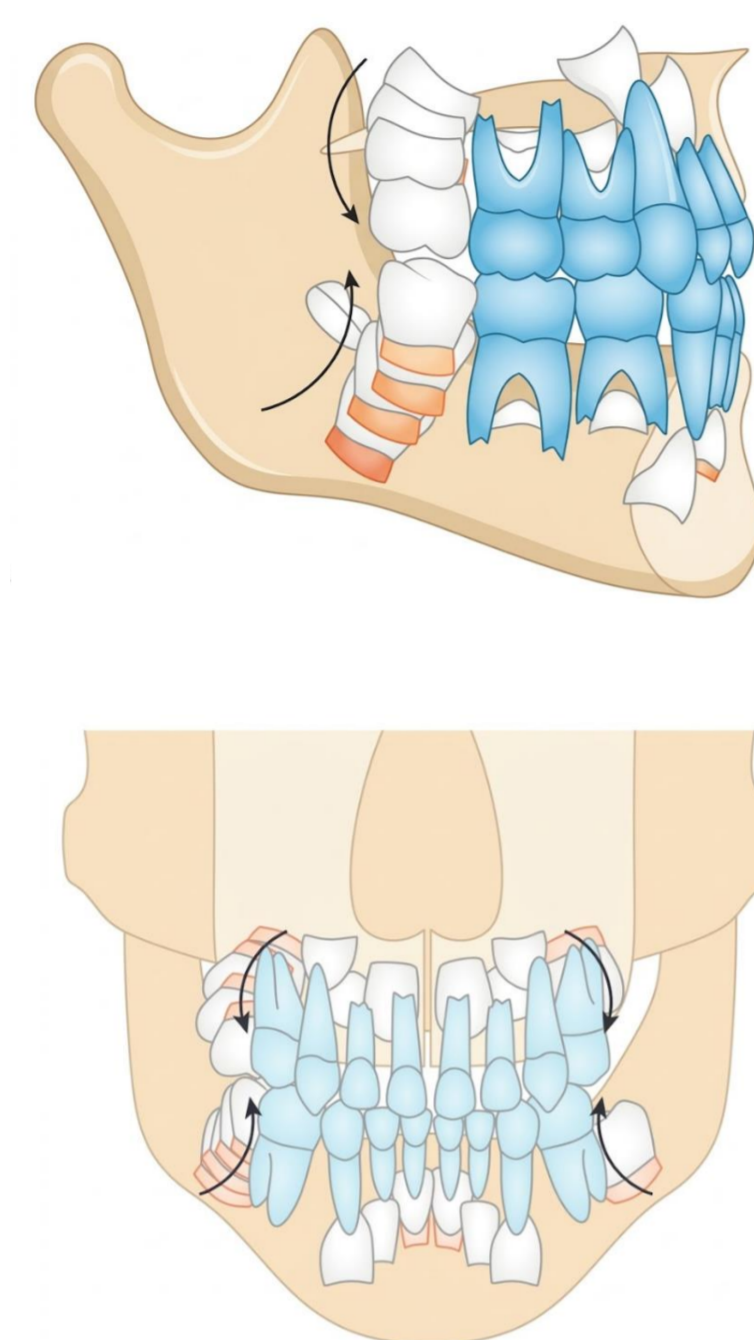
## Introduction

The first permanent molar plays a critical role in the developing occlusion. When its eruption is disturbed, consequences extend beyond a single tooth, affecting arch development and treatment complexity.

**Eruption disturbances have been attributed to local factors:**

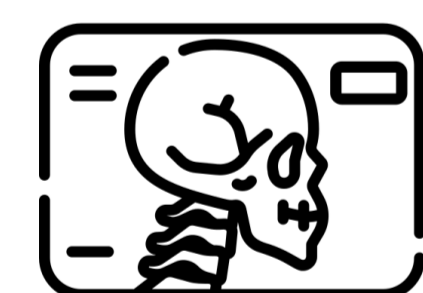
- Abnormal eruption angle of the permanent first molar
- Insufficient arch space
- Discrepancies between tooth size and arch length

However, the relationship with underlying skeletal characteristics in both the maxilla and mandible remains unclear.

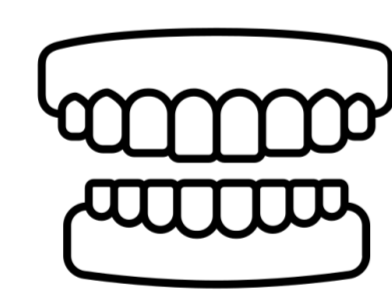


## Materials & Methods

- From January 2014 to December 2024, a total of 257 cases related to eruption disturbances of the first permanent molars were identified at the Department of Pediatric Dentistry, Pusan National University Dental Hospital.
- Of these, 153 patients who met the inclusion criteria were included in the final analysis.



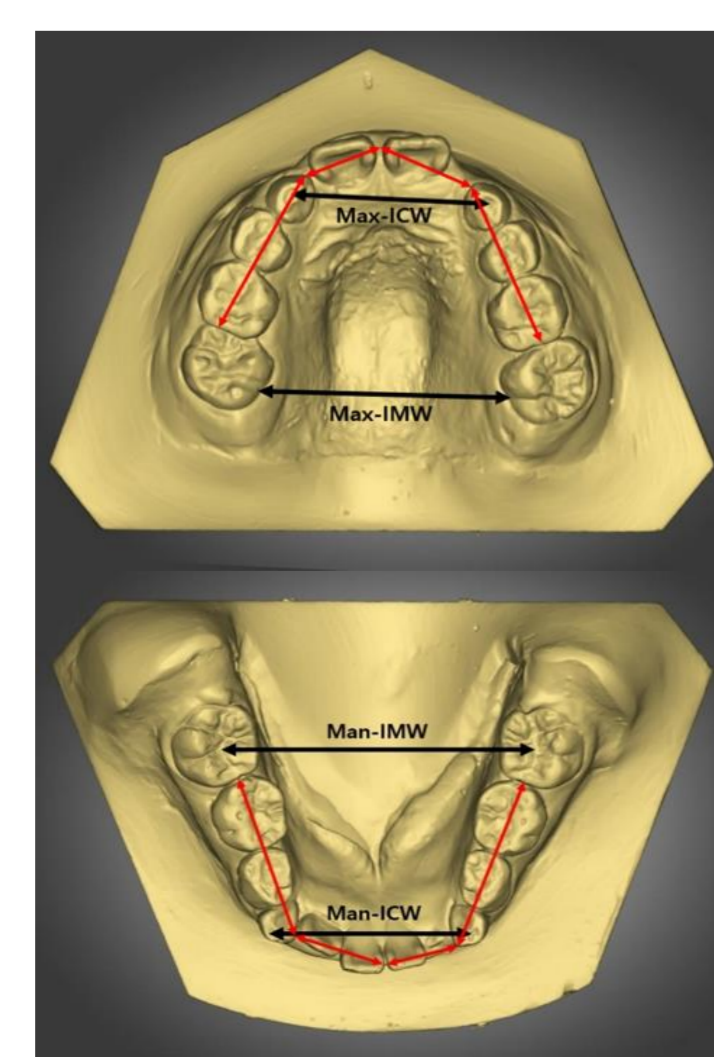
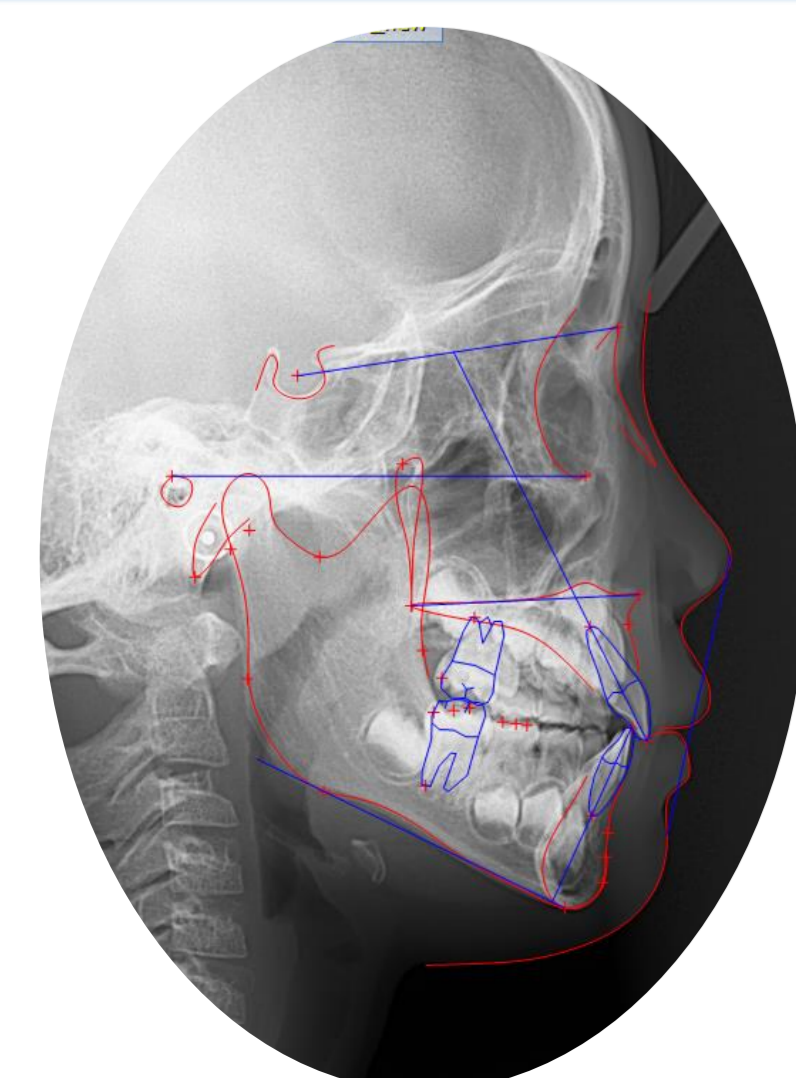
Lateral cephalometric radiographs (V-Ceph™ 8.0)



Digital dental models (TRIOS 4 scanner + Dentone software)

- Anteroposterior Dysplasia Indicator (APDI)
- Overbite Depth Indicator (ODI)
- ANB angle
- Wits appraisal
- Frankfort–Mandibular Plane Angle (FMA)
- Combination Factor (CF) = ODI + APDI

- Arch perimeter
  - Intercanine/intermolar widths
  - Sum Index (SI) ratio
- SI Ratio =  $\frac{\text{Sum of maxillary 4 incisor widths}}{\text{Sum of mandibular 4 incisor widths}}$



## Results

- ▶ U6 Group (Maxillary eruption disturbance) : 117 cases
- ▶ L6 Group (Mandibular eruption disturbance) : 22 cases
- ▶ UL6 Group (Maxillary & Mandibular eruption disturbance): 14 cases

### Skeletal Relationships According to Eruption Disturbance groups

	U6 (%)	L6 (%)	UL6 (%)
Class I	75 (64.1)	12 (54.5)	6 (42.8)
Class II	16 (13.7)	9 (40.9)	6 (42.8)
Class III	26 (22.2)	1 (4.5)	2 (14.3)
Total	117 (100)	22 (100)	14 (100)

U6 group → Class III tendency

L6 group → Class II tendency

UL6 group → Class I & II

### Cephalometric measurements according to Eruption Disturbance groups

	U6	L6	UL6	p-value
CF	152.34 ± 5.65	151.78 ± 5.73	150.80 ± 6.08	0.753
ODI	70.91 ± 5.55	73.68 ± 4.40	72.67 ± 4.64	0.126
FMA (degree)	28.78 ± 4.41	26.41 ± 4.89	29.30 ± 3.49	0.131
APDI (degree)	81.52 ± 4.68 <sup>a</sup>	78.10 ± 4.44 <sup>b</sup>	78.13 ± 5.23	0.005
ANB (degree)	2.81 ± 2.29 <sup>a</sup>	4.34 ± 1.88 <sup>b</sup>	4.21 ± 2.10	0.002

a,b indicate a significant difference between the three groups ( $p < 0.05$ ).

U6 group → large APDI, small ANB

L6 group → small APDI, large ANB

### Comparison of SI ratio among the Eruption Disturbance groups

	U6	L6	UL6	p-value
Sum of 4 upper incisors (mm)	32.10±1.89	31.44±1.51	31.43±1.61	0.061
Sum of 4 lower incisors (mm)	22.80±1.19	23.29±1.08	23.09±1.00	0.213
SI ratio	1.41±0.09 <sup>a</sup>	1.35±0.07 <sup>b</sup>	1.36±0.07	0.005

a,b indicate a significant difference between the three groups ( $p < 0.05$ ).

U6 group → Larger Mx. tooth-size proportion

### Comparison of arch dimensions among the Eruption Disturbance groups

	U6	L6	UL6	p-value
Mx intercanine width	32.52±2.46	33.40±2.08	33.14±2.24	0.278
Mn intercanine width	26.30±2.17 <sup>a</sup>	27.39±2.13 <sup>b</sup>	27.17±1.58	0.016
Mx intermolar width	36.76±2.93	37.71±3.02	37.58±2.03	0.343
Mn intermolar width	42.81±2.36	42.11±3.94	42.09±1.90	0.536
Mx arch perimeter	71.58±5.17 <sup>b</sup>	76.31±3.42 <sup>a</sup>	72.83±5.11 <sup>a,b</sup>	<0.001
Mn arch perimeter	68.33±4.21	68.82±4.71	66.32±4.78	0.130

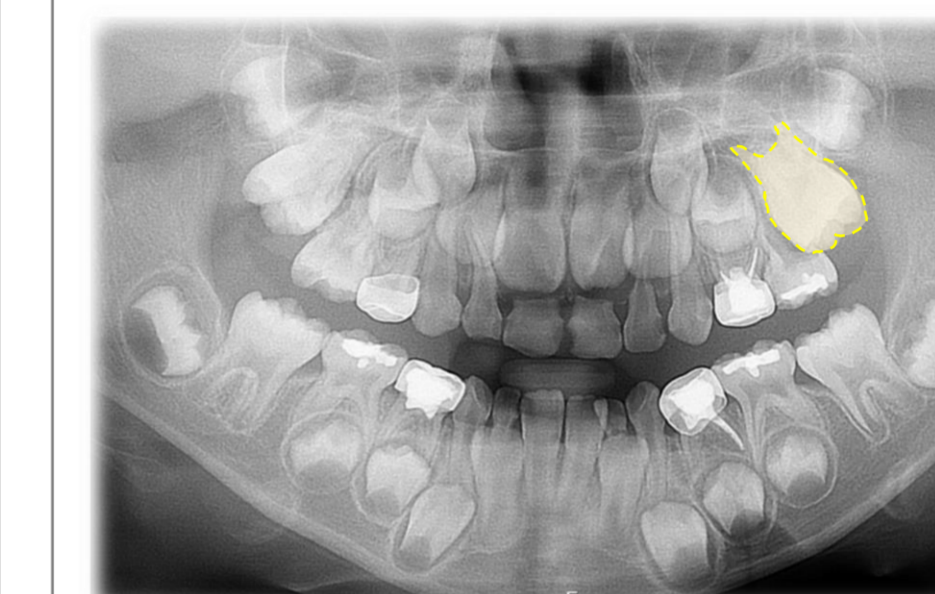
a,b indicate a significant difference between the three groups ( $p < 0.05$ ).

U6 group → Reduced Mn. intercanine width → Reduced Mx. arch perimeter

## Discussion

U6 → Class III tendency

- Maxillary arch space deficiency
- Maxillary retrusion



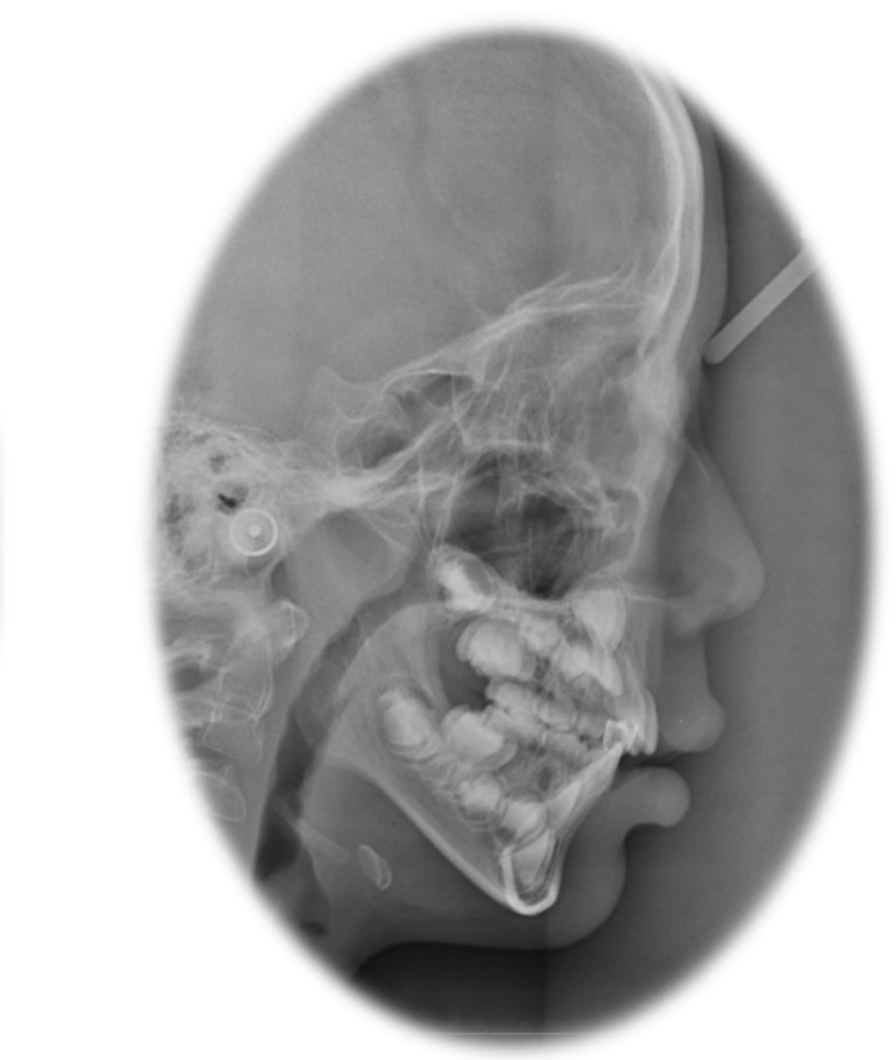
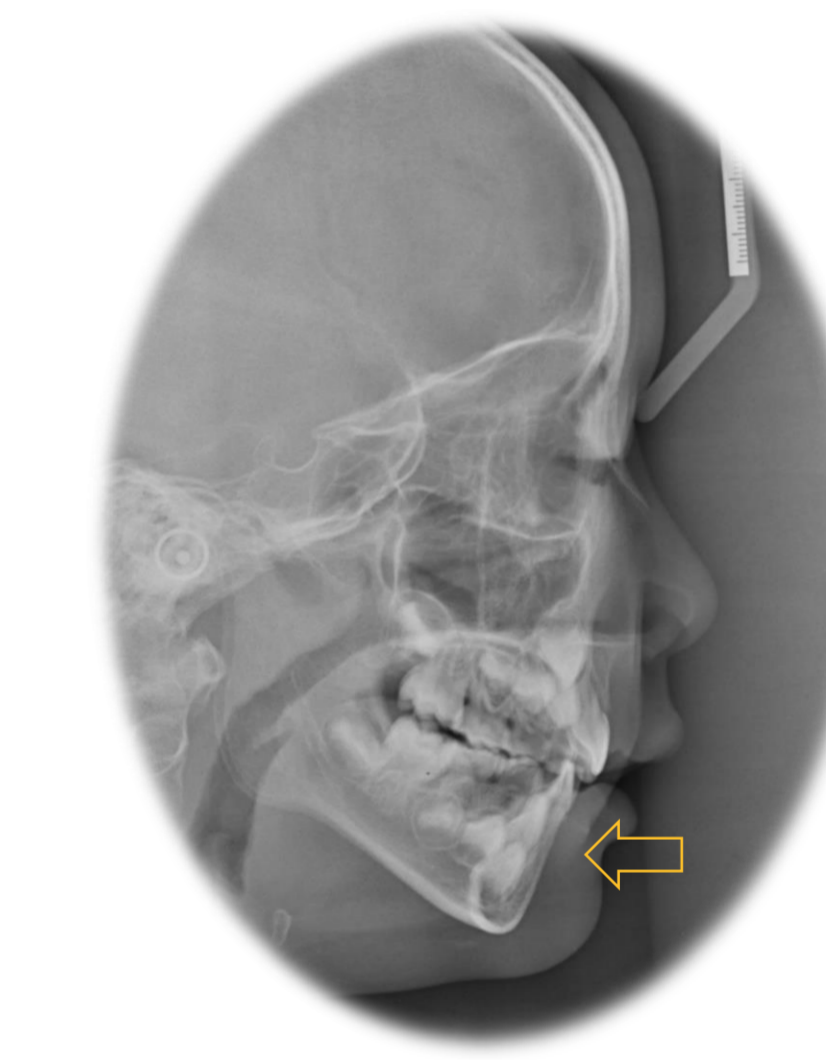
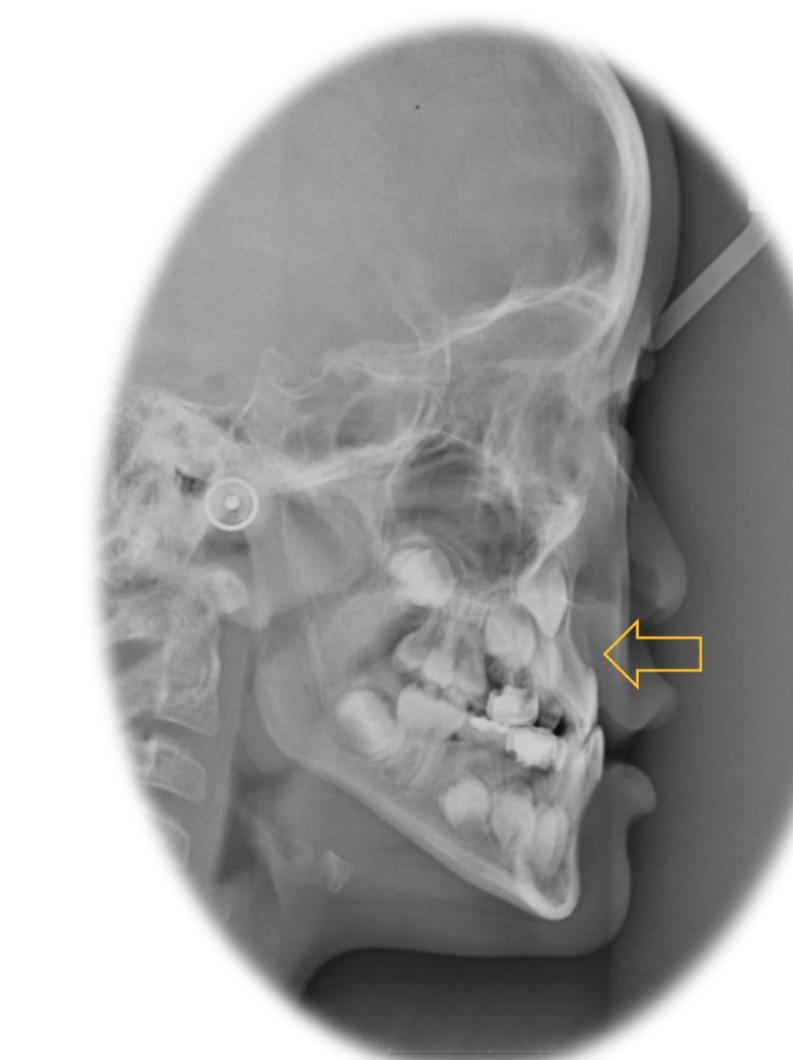
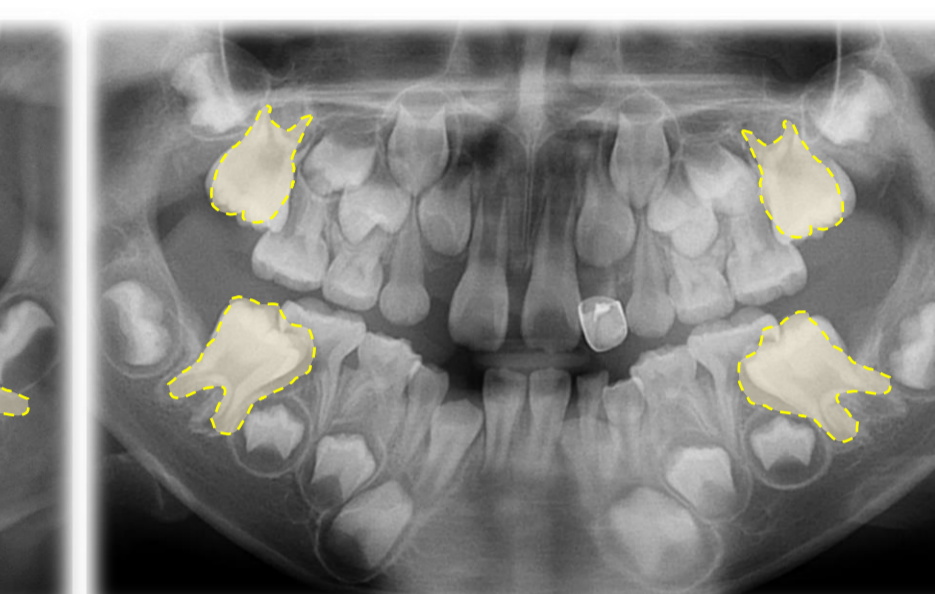
L6 → Class II tendency

- Delayed development of the mandibular arch
- Maxillary retrusion



UL6 → Class I & II

Complex interactions between the maxilla and mandible



▶ U6 Group

- Higher SI ratio → relatively larger maxillary anterior teeth
- Reduced maxillary arch perimeter → limited available space
- Clinical implication → mesially inclined eruption of the first molar → increased risk of impaction against the second primary molar

▶ L6 Group

- Larger mandibular intercanine width → unexpected finding despite mandibular space deficiency
- Possible explanations → Higher mean age → arch width increases during mixed dentition → Relatively larger mandibular incisors → increased space demand

## Conclusion

In conclusion, eruption disturbances vary by location and are associated with different skeletal patterns and arch characteristics. These findings highlight the importance of comprehensive evaluation.