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Orthodontics.

Dentofacial growth and development

Key concepts

- Facial growth
  - Face height
    - 70% completed by age 3, 90% completed by the start of the adolescent growth spurt
  - Face width (transverse growth)
    - Almost nearly complete by age 6
  - Face depth (A-P growth)
    - Last dimension to finish growing
    - Growth of the lower 1/3 of the face is greatest due to relatively greater mandibular growth than maxillary growth during childhood and adolescents
- Adolescent growth spurt

Timing of the male and female growth spurts

	Female	Male
Starts	~10.5-11 years	~12.5-13.5 years
Peaks	~12-13 years	~14-16 years
Completed	~13.5-14 years	~17-18 years

Sources: Nowak, A, Casamassimo P eds. The handbook of pediatric dentistry. 5th ed. Chicago: American Academy of Pediatric Dentistry; 2018.

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Dentofacial growth and development

Eruption sequence of primary teeth

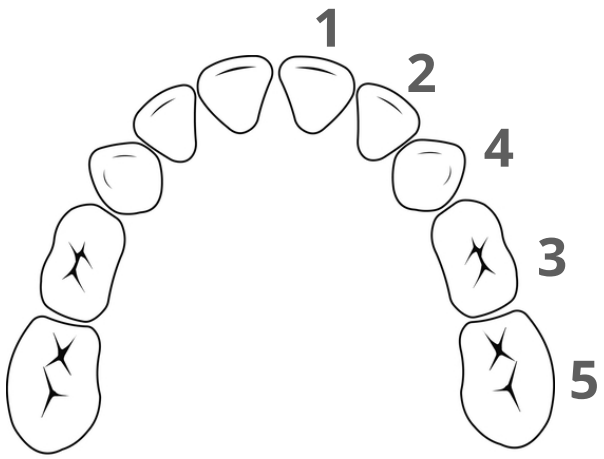

Image. Eruption sequence of primary teeth

Maxillary and mandibular

1. Central incisors
2. Lateral incisors
3. First molar
4. Canines
5. Second molars

Sources: American Academy of Pediatric Dentistry

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Dentofacial growth and development

Eruption, calcification, and exfoliation sequence of primary teeth

		Calcification begins (months in utero)	Crown complete (months)	Eruption (months)	Root complete (years)	Exfoliation (years)
Maxillary	Central	4	1.5	8-12	1.5	6-7
	Lateral	4.5	2.5	9-13	2	7-8
	Canine	5	9	16-22	3.25	10-12
	First molar	5	6	13-19	2.5	9-11
	Second molar	5	11	20-30	3	9-12
Mandibular	Central	4.5	2.5	6-10	1.5	6-7
	Lateral	4.5	3	10-16	1.5	7-8
	Canine	5	9	17-23	3.25	9-12
	First molar	5	5.5	14-18	2.25	9-11
	Second molar	6	10	23-31	3	10-12

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Sources: American Academy of Pediatric Dentistry

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Dentofacial growth and development

Eruption sequence of permanent teeth

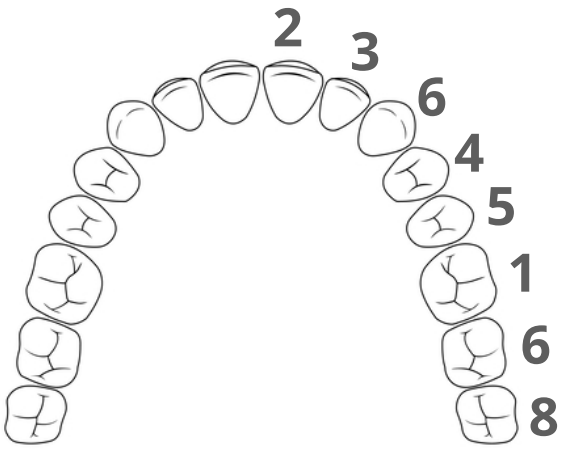

Image 1. Eruption sequence of maxillary permanent teeth

Mandibular

1. First molars
2. Central incisors
3. Lateral incisors
4. Canines
5. First premolars
6. Second premolars
7. Second molars
8. Third molars

Maxillary

1. First molars
2. Central incisors
3. Lateral incisors
4. First premolars
5. Second premolars
6. Canines
7. Second molars
8. Third molars

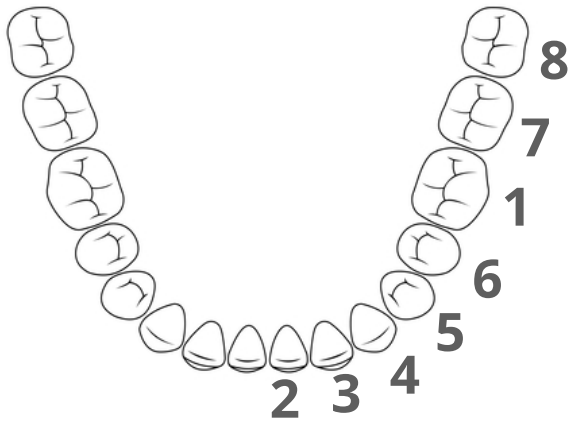

Image 2. Eruption sequence of mandibular permanent teeth

Sources: American Academy of Pediatric Dentistry

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Dentofacial growth and development

Eruption and calcification sequence of permanent teeth

		Calcification begins (months in utero)	Crown complete (years)	Eruption (months)	Root complete (years)
Maxillary	Central	3-4 months	4-5	7-8	10
	Lateral	10-12 months	4-5	8-9	11
	Canine	4-5 months	6-7	11-12	13-15
	First premolar	1.5-1.175 years	5-6	10-11	12-13
	Second premolar	2-2.25 years	6-7	10-12	12-14
	First molar	At birth	2.5-3	6-7	9-10
	Second molar	2.5-3 years	7-8	12-13	14-16
	Third molar	7-9 years	12-16	17-21	18-25

Sources: American Academy of Pediatric Dentistry

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Dentofacial growth and development

Eruption and calcification sequence of permanent teeth (cont.)

		Calcification begins (months in utero)	Crown complete (years)	Eruption (months)	Root complete (years)
Mandibular	Central	3-4 months	4-5	6-7	9
	Lateral	3-4 months	4-5	7-8	10
	Canine	4-5 months	6-7	9-10	12-14
	First premolar	1.75-2 years	5-6	10-12	12-13
	Second premolar	2.25-2.5 years	6-7	11-12	13-14
	First molar	At birth	2.5-3	6-7	9-10
	Second molar	2.5-3 years	7-8	11-13	14-15
	Third molar	8-10 years	12-16	17-21	18-25

Sources: American Academy of Pediatric Dentistry

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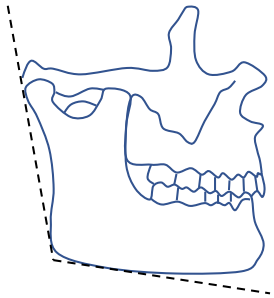
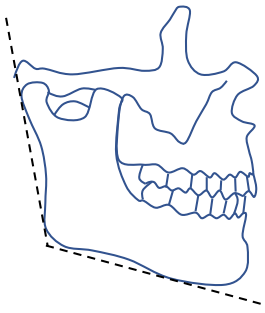
Dentofacial growth and development

Growth patterns



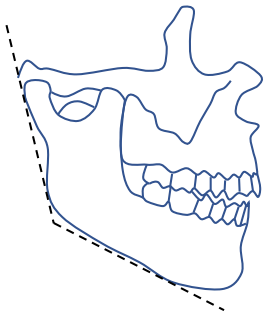
Brachycephaly

- Horizontal growth pattern
- Flat mandibular plane angle
- Broad, wide face
- Wide dental arches
- Deep bite tendency



Mesocephaly

- Considered “average” or “normal”
- Balanced growth pattern



Dolicocephaly

- Vertical growth pattern
- Steep mandibular plane angle
- Tall, narrow face
- Narrow dental arches
- Open bite tendency

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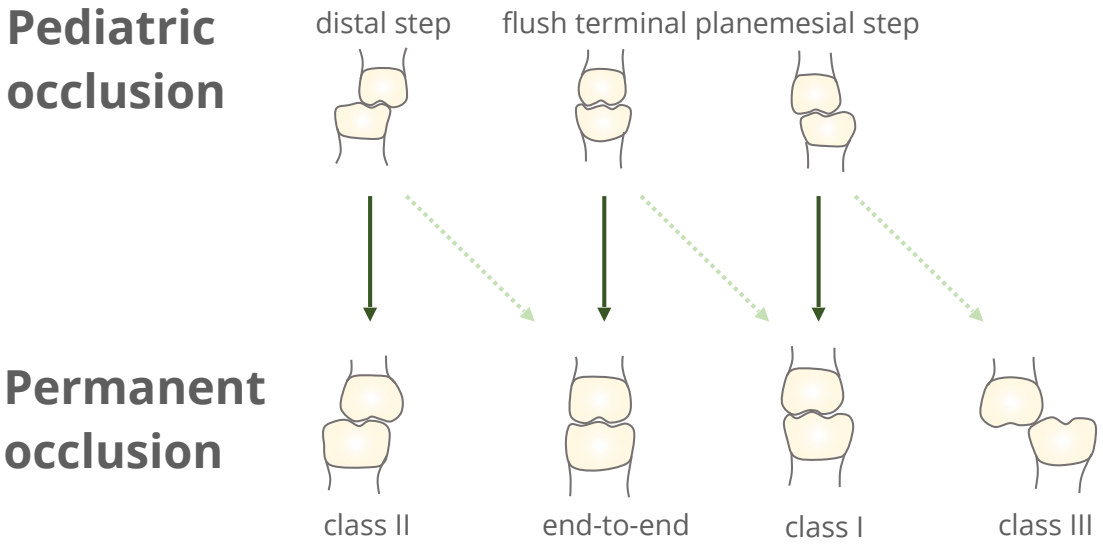
Dentofacial growth and development

Transition from primary occlusion to permanent occlusion



Key points

- Ideal primary occlusion:
  - Mesial step or flush terminal molar and class I canines
  - Generalized spacing (including primate spaces)
  - ~2mm overjet and ~2mm overbite (30%)
- Factors influencing transition from primary to permanent occlusion:
  - Beginning primary occlusion
  - Primate spacing (early mesial shift)
  - Leeway spacing (late mesial shift)
  - Growth differential (in the A-P direction) of the mandible relative to maxilla (mandible>maxilla)

→: minimal mesial shift of dentition, minimal preferential A-P growth of mandible

⇢: mesial shift of dentition, preferential A-P growth of mandible

Sources: Nowak, A, Casamassimo P eds. The handbook of pediatric dentistry. 5th ed. Chicago: American Academy of Pediatric Dentistry; 2018.

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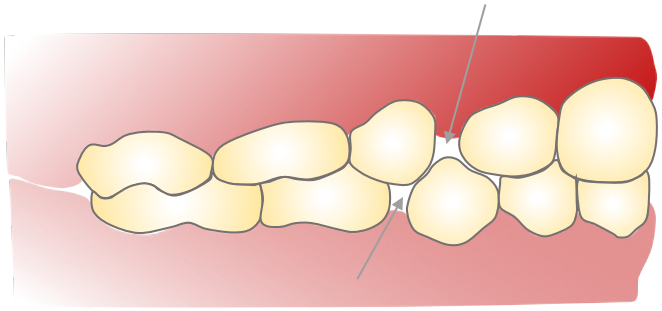
Primate space

- Naturally occurring interdental space located mesial to the primary maxillary canine and distal to the primary mandibular canine
- **Early mesial shift**: as the 1st permanent molar erupts, the eruptive forces encourage mesial movement of the primary molars into the primate space
    - This closes the primate space



Primate space

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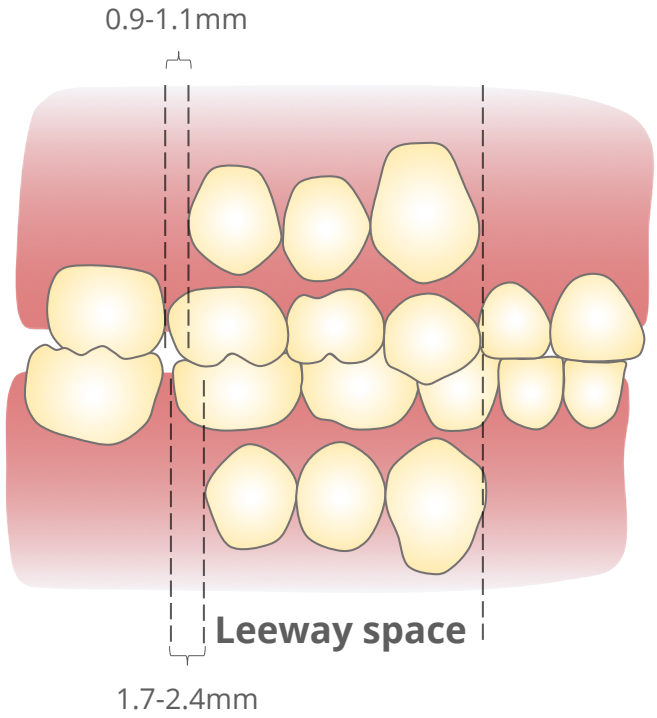
Leeway space

- Mesio-distal size difference between the primary canine and primary molar segment (C-D-E) and the permanent canine and permanent premolar segment (3-4-5)
  - In maxilla: ~0.9-1.1mm
  - In mandible: ~1.7-2.4mm
- Late mesial shift: the 1st permanent molar shifts mesially into the leeway space following exfoliation of 2nd primary molar



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