DEVELOPMENT OF TEETH

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• A complex biological process involving epithelial mesenchymal interactions, morphogenesis and mineralization

• 20 deciduous and 32 permanent teeth

Formation of Primary Epithelial Band

• At thirty seven days of IU development

• Horseshoe shaped corresponding to future dental arches
Primary epithelial Band

Mitosis seen in thickened Oral epithelium at 5th week of I.U. life

change in the plane of cleavage of cells
Dental Lamina

Fig. 2.5: The oral epithelium thickens and invaginates into the mesenchymal tissue to form primary epithelium band (dental lamina) for the development of tooth (bud stage)
Fate of Dental Lamina:

- Teeth lose their connection with DL
- Later on it gets invaded by mesenchyme
- Remnants of DL may persist as Epithelial pearls or islands within the jaw &/or gingiva
Vestibular Lamina

Fig. 2.6: The primary epithelial band divides into two processes, the vestibular lamina and the dental lamina (embryo sixth week, CR length 10 mm)
STAGES OF TOOTH DEVELOPMENT

- Bud Stage
- Cap Stage
- Bell Stage
- Advanced Bell Stage

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STAGES OF TOOTH DEVELOPMENT

- Bud Stage: Initiation
- Cap Stage: Proliferation
- Early Bell Stage: Histo-differentiation
- Advanced Bell Stage: Morpho-differentiation
Bud Stage

Fig. 2.8: Tooth development: Bud stage (Proliferation stage). Embryo about 15 mm in length (sixth week). Cells of the bud stage under high magnification.

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Cap Stage

- Tongue
- Dental lamina
- Outer enamel epithelium
- Enamel organ
- Enamel cord
- Stellate reticulum
- Inner enamel epithelium
- Dental papilla
- Vestibular lamina
- Developing cap stage
- Bone
- Meckel's cartilage
Cap Stage

2 – Enamel Organ
3 – Dental Papilla
4 – Successional Lamina
5 – Dental Lamina
6 – Dental Sac
7 – Dental Follicle

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Bell Stage

Diagram showing various structures in the early bell stage of tooth development:
- Oral epithelium
- Dental lamina
- Enamel niche
- Primordium of permanent tooth
- Enamel organ
- Enamel cord
- Outer enamel epithelium
- Stellate reticulum
- Stratum intermedium
- Inner enamel epithelium
- Dental papilla (future pulp)
- Dental sac or follicle

Section of early bell stage of tooth development showing various structures. (E 120 mm) 14 weeks, (weight 110 gm)
Bell Stage

Dental lamina
Outer enamel epithelium
Epithelial enamel organ
Stratum intermedium membrane preformative
Ameloblasts
Inner enamel epithelium
Vascular pattern within the dental papilla
Primordium of permanent tooth
Stellate reticulum
Blood vessels
Odontoblasts
Capillary
Dental papilla (future pulp)
Bone

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Bell Stage

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Advanced Bell Stage

Fig. 2.24: Advanced bell stage: Dentinogenesis (Appositional stage). Labiobuccal section through deciduous mandibular first molar. Embryo about 190 mm in length (20 weeks, fetal weight 460 gm) showing dentin formation.

Fig. 2.25: Very advanced bell stage: (Dentinogenesis-amelogenesis stage). Labiobuccal section through deciduous mandibular first molar. Embryo about 210 mm CR length (22 weeks), fetal weight 630 gm showing formation of enamel, dentin and epithelial diaphragm. Outer enamel epithelium is laid in folds in which vascularity increases to provide nutrition to ameloblasts to form enamel.
Advanced Bell Stage

Showing Formation of Pre-dentin and Enamel

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Hertwig’s Epithelial Root Sheath and Root Formation

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Hertwig’s Epithelial root sheath and Root Formation
Formation of Root

- Dentin
- Predentin
- Dental papilla (future pulp)
- Dentin of root
- Predentin layer
- Odontoblasts
- Dental papilla
- Developing cementum
- Developing periodontal ligament
- Developing alveolar bone
- Developing cementum
- Epithelial cell rests
- Cementoblasts
- Developing periodontal ligament
- Root dentin formed and Hewig's epithelial root sheath disappeared
- Intermediate layer of dental follicle
- Hertwig's epithelial root sheath in the region of the root diaphragm
- Inner investing layer of dental follicle
- Outer layer of dental follicle
- Undifferentiated mesenchyme

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Formation of root – Multi-rooted teeth

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Formation of root – Multi-rooted teeth
Formation of root – Multi-rooted teeth

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Clinical Considerations

- Abnormal Location of teeth
- Anodontia – Partial or complete
- Supernumerary teeth
- Osteodentin – Atypical Dentin developing in deficiency of Vit. A
Clinical Considerations – contd..

- Delayed eruption – Hypopituitarism and Hypothyroidism
- Enamel Hypoplasia - Genetic or Environmental
- Hutchinson incisors and mulberry molars