Tooth Eruption & Shedding

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• Jaws of infant can accommodate few teeth

• Larger jaws require more and larger teeth

• Accomplished by two sets of dentition

• Teeth develop within jaws

• Become functional and move to occlusal position
Teeth Movement

• Pre eruptive tooth movement
  – Within jaws before eruption

• Eruptive tooth movement
  – Movement from developmental to functional position
    • Intraosseous & Extraosseous component

• Post eruptive tooth movement
  – Maintaining the position
Pre Eruptive Tooth Movement

- Small deciduous teeth in large jaws
- Rapid growth leads to crowding
- Crowding relieved by lengthening of jaws
- Molars move back and anteriors move forward
- Outward and Upward movement occurs too.
Pre Eruptive Tooth Movement

- Permanent teeth develop lingually in same crypt
- Anteriors occupy position lingually
- Premolars position themselves in between divergent roots of deciduous teeth
- Permanent teeth develop from the distal extension of lamina
Pre Eruptive Tooth Movement

• No/ Little room for development of these teeth

• Maxillary molars develop with occlusal aspect facing distally

• Mandibular molars develop with occlusal aspect facing mesially
Pre Eruptive Tooth Movement

• Combination of two factors
  – Bodily movement of the tooth
  – Growth of teeth where germ remains fixed

• Bone remodelling
  – During mesial growth
  – During eccenteric growth
Eruptive Tooth Movement

- Mechanism similar for both sets of dentition
- Involves movement from developmental to occlusal/functional plane
Histological features

• Root development

• Periodontal ligament formation
  – Fibroblasts
Gubernacular cord/Canal

- Architecture of tissues in advance of erupting permanent teeth differs

- Fibrocellular follicle retains connection with the lamina propria of the OMM by a strand of tissue containing remnants of dental lamina k/as gubernacular cord

- On lingual aspects in jaws canals can be seen
Gubernacular cord

Dental follicle

Resorbing bone, enlarging canal for eruption

Dental follicle

A

B

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Gubernacular canals
• As the permanent tooth erupts, the canal widens thus making a pathway for the tooth to erupt

• Rate of eruption varies
  – Intraosseous— 1-10 um/day
  – 75 um once it escapes bony cell

• Erupting tooth subjected to various forces in oral cavity
  – Forces from tongue, lips, cheeks
  – Adjacent teeth
  – Oral habits
Mechanism of Eruptive tooth movement

• Multifactorial process
  – Root formation
  – Hydrostatic pressure
  – Bony remodelling
  – Dental follicle
  – Periodontal ligament traction theory
Root Formation

• Root formation causes elongation of teeth leading to increase in jaw height and occlusal movement of tooth

• Clinical observation, Experimental studies & Histological data suggest otherwise
• Experimental studies on rats/hamsters

• Two conclusions
  – Root growth produces a force
  – This force produces resorption of bone

• Root growth not translated into eruptive force

• Not possible unless some fixed base is there
• Other points against
  – Rootless teeth erupt
  – Some teeth erupt greater length than total length of their roots
  – Teeth still erupt after root completion
  – Even after removal of tissues like HER’s, Apical papilla, periapical tissues, the teeth erupt
Hydrostatic pressure

- Higher pressure system around the base
- Teeth move in synchrony with the arterial pulse
- Swelling of ground substance from 30%-50%
- Surgical excision of growing root & associated tissues have still failed to stop eruption

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Bony remodelling

• Resorption and deposition of bone

• Experiments on dogs

• Bone remodelling in crypt leading to axial movement of tooth not proven

• Base of crypt of first and third molar resorbs but Bone deposition on second premolar and molar
Dental follicle

- Necessary to permit bone remodelling along with REE
- Presence of EGF, TGF, CSF necessary for recruiting osteoclasts to the follicle
- REE also secretes proteases which lead to making a path of least resistance
• These epithelial signals explain consistancy of eruption timings

• Radicular follicle does not degenerate but form PDL

• But does not explain the force generation required for tooth eruption
Periodontal ligament traction theory

- Forces for tooth movement reside in PDL

- Experimental studies on
  - Collagen synthesis
  - Barrier placement between erupting tooth
  - Contractility of fibroblasts

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• Force generation by
  – Oblique arrangement of fibers
  – Maintenance of this orientation