Unit II

Dental Materials and the Oral Environment
Physical Considerations

- Dentist is like an engineer
- Restoration built on solid foundation
- Dentist restricted with design of restoration/appliance placed in mouth
- Only small amount of tooth structure removed safely without injuring vital tooth.
Physical Considerations

- Very difficult to formulate restorative materials to resist:
  - Fracture
  - Temperature changes
  - Alterations in pH
  - Discoloration (while matching existing color)
  - Esthetics
Physical Considerations

- Conditions in oral cavity
- Limitations of material must be understood when selecting & using materials
Physical Considerations

- determining treatment the dentist must consider:
  - 1) limitations
  - access & visibility
  - 2) Design Restrictions
  - physical & biological
  - required bulk for strength
    - Forces of mastication
Physical Considerations

3) Health Considerations
- Oral cavity ideally suited for destruction
- Tooth structure and restorative materials
- Materials choice would harm oral cavity
- May not be esthetically pleasing
- Too hard to manipulate
Health Consideration Concerns

- Appearance
- Chemical elements
- Allergies
Biting Forces

- biting force for permanent molar
  - 170 psi
- Psi = (pounds per square inch)
- force past 28,000 psi on tip of cusp
- measured in psi, newtons, meganewtons, pascals and megapascals
Temperature Changes

- fluctuates rapidly
- 100+ degrees within seconds
- expansion vs. contractions
Alkaline or Acidic Effects

- oral pH varies greatly
- low pH = acidic - citrus foods
- high pH = alkaline - raw veggies
- neutral pH is 7.0
- metallic restorations can discolor/corrode
- non-metal restorations can deteriorate
Physical Considerations

- Oral cavity warm & moist with variety of fluids, food debris and enzymes.
- Factors create favorable environment for plaque formation.
Biological Considerations

- Local or systemic injury very important
- Material has strength & resistance to corrosion is no good if damages occur to pulp or soft tissues
- Mouth is the start of digestive (gastrointestinal) system
Biological Considerations

- Microleakage
- Temperature Effects
- Galvanism
- Toxic Effects
- Chemical Irritations
Biological Considerations

1) Microleakage:

- Occurs at microscopic space between tooth & restoration
- Fluids, microorganisms & debris from saliva in space
- **Interface**
  - Area where restoration & enamel meet is
- Organisms occupy space & begin breakdown of tooth
2) **Temperature Effects**

- Fluctuations may crack restorative materials or teeth.
- Metals conduct hot & cold within seconds.
- Large restorations must protect pulp from shock.
- Stop conductivity with protective base or cement.
3) **Galvanism**

- restorations of unlike material/metal in presence of saliva create effect called galvanic (electric) current (shock)

- silverware + filling + saliva = charge

- charge may irritate pulp, produce sharp throbbing pain
4) **Toxic Effects/Chemical Irritations**

- Acidity of certain toxic or irritating ingredients
- Effect on living tissue
- Pulp can die from a chemical traveling down tubules
- Such as phosphoric acid
Biological Considerations

Toxic Effects/Chemical Irritations

- undesirable effects on pulp can be produced by chemical reactions during hardening or setting

- expansion and contraction of setting material
Classification of Restorative Materials

Composition of the material

- ie: metal, plastic, resin, ceramic

Intended purpose

- short term = temporary
- longer term = permanent
Permanent

- Long lasting
- impossible to predict lifetime of restoration
- Intended objective 7+ years
- Metallic restorations amalgam, gold(crowns, inlays or onlays) have physical properties to last unlike tooth colored restoratives
Temporary

- Intention is short term to promote healing
- 4-6-8 weeks
- Materials can have a sedative effect

- IRM, ZOE, B & T
- Protemp, Luxatemp
Intermediary Base

- between restoration and tooth
- insulates against shock, blocks out irritants
- nonirritating and promote healing
- due to close proximity to the pulp the material must be soothing
- CaOH or ZOE
Other Materials

Varnishes
- resin type thin liquid that seals dentinal tubules

Bonders or Adhesive bonders
- cured or self setting to seal the area
- adheres to tooth structure and restoration

Bonding Resins
- Materials that bond directly to tooth structure without adhesive
Fig. 44-1 Placement of a liner.
Fig. 44-5 Location for placement of a base.
Selection of the Material

- **Condition of the pulp**
  - Any history of sensitivity
  - Closeness of prepped area to pulp
  - Direct/indirect pulp exposure

- **Esthetics required**
  - Position of needed restoration
  - Anterior/posterior placement
  - Patient requests
4 Key Factors Determining Selection of Material

- **Biting forces**
  - Occlusal vs. incisal
  - Posterior vs. anterior
  - Existing dentition

- **History of success**
  - Material success
  - Doctors ease of use
  - Location specific
  - Patient history with material