



# Plastic Deformation...*not* Melting

*...the apically-warmed gutta percha is only heated  
2 to 3 degrees C above body temperature*

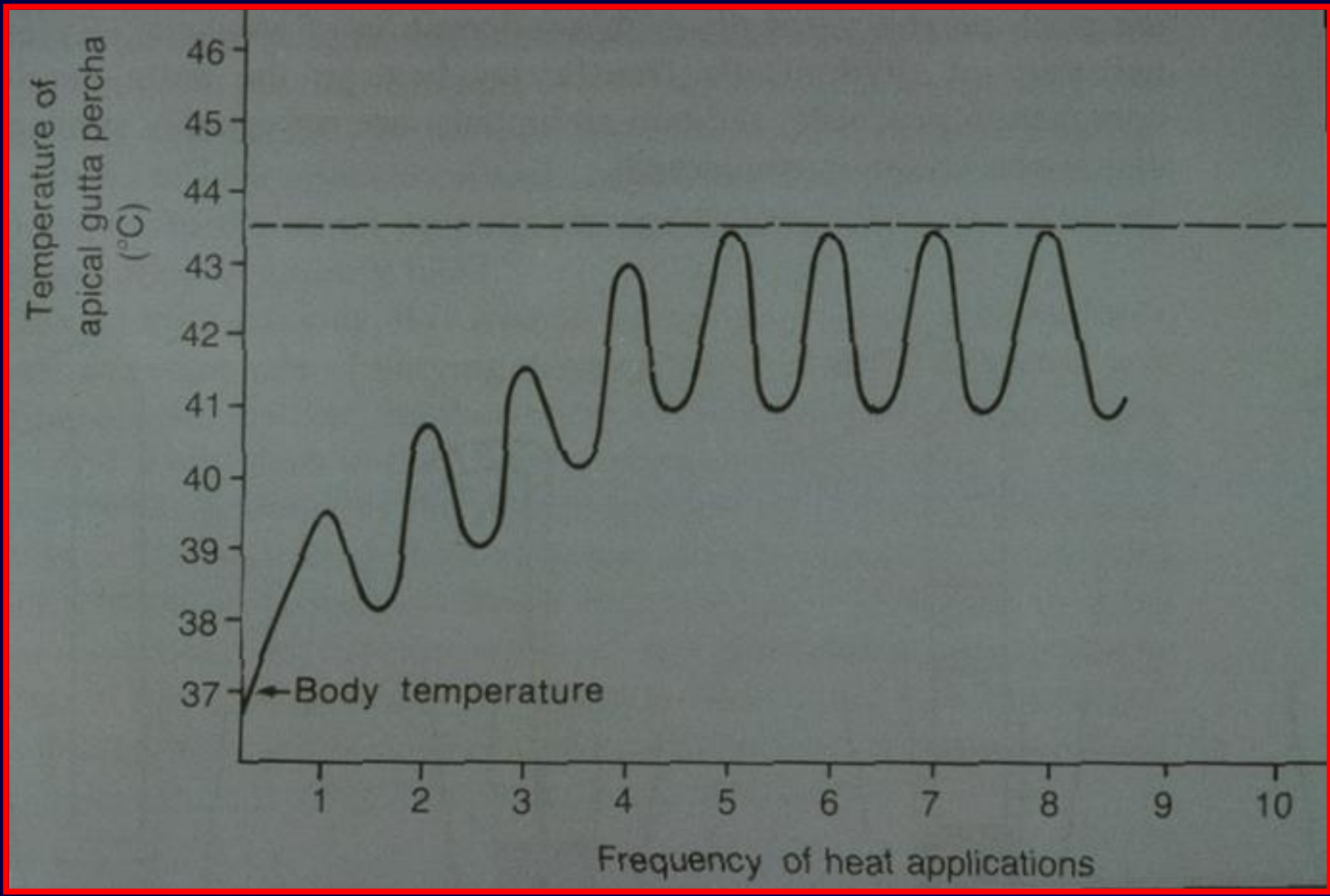
Gutta Percha is a complex molecule of rubber that goes through 3 distinct phase changes as temperature is increased...

ALPHA -> BETA -> AMORPHOUS

...these phase changes result in significant changes in volume and shrinkage

*Techniques that require **direct** heating of the gutta percha undergo phase changes and effect the seal.*

- 1. Gutta percha coated obturators**
- 2. Injection techniques**
- 3. Continuous heat delivery units**



# Thermomechanical Properties of Gutta-Percha

Goodman, A.

Master's Thesis, Boston University School of Graduate Dentistry, 1973

*Measured volume changes of gutta percha as it was subjected to temperature during the vertical compaction of warm gutta percha*

# Goodman Results:

1. **Temperatures of only 3-8 degrees C above body temperature are needed to mold apical gutta percha**
2. **Thermal penetration into gutta percha seldom exceeded 4 - 6 mm from the tip of the heat carrier**

..... and

## Goodman Results (cont.):

3. **Peak temperature of coronal gutta percha is 80 degrees C and 45 degrees C in the apical 2mm**
4. **The apical segment of gutta percha rarely exceeds 45 degrees C**

.....and

# Goodman Results (cont.):

5. When gutta percha is heated from room temperature to 80 degrees C and cooled to body temperature (37 degrees C), there is a 1 % loss of volume relative to the original volume at room temperature
6. When heating gutta percha from room temperature to 45 degrees C and cooling to 37 degrees C there is a net increase in volume of 1.3%