



# Physical Agents utilized in Physical Medicine and Rehabilitation



- Heat
- Cold
- Water
- Pressure
- Sound
- Electrical Current



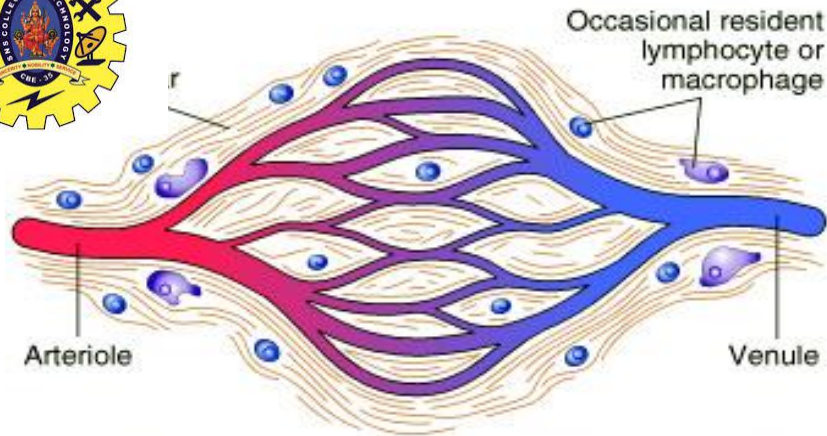
# General Indications

- Modulate pain
- Reduce or eliminate inflammation
- Increase rate of healing
- Modify muscle tone
- Increase connective tissue extensibility

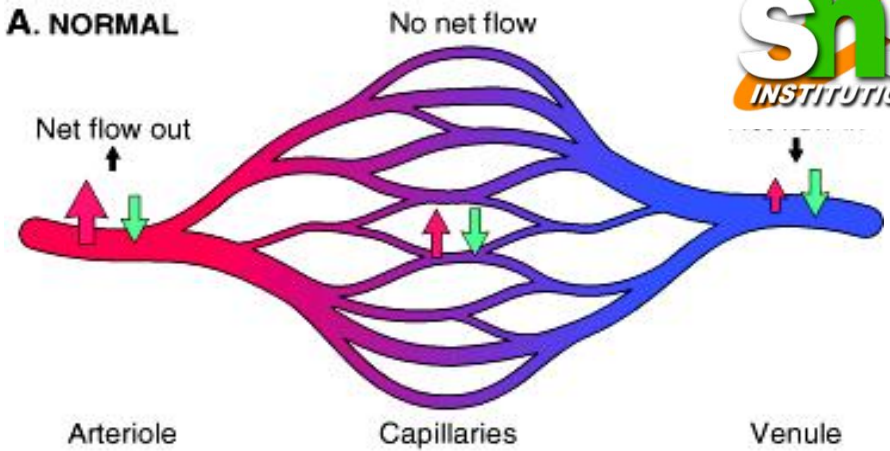


# Acute Inflammation

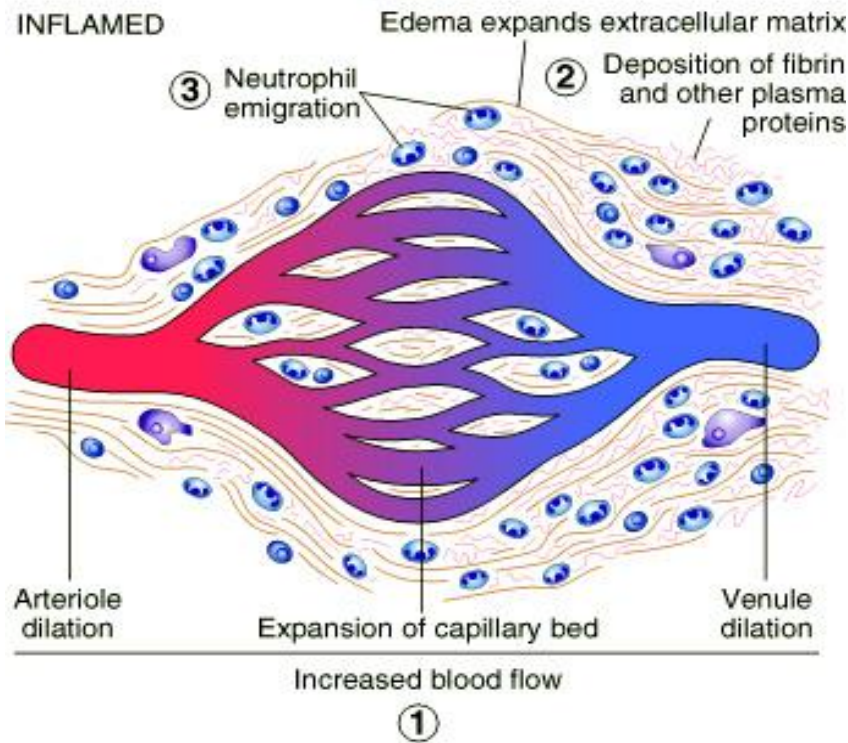
- Local clinical signs of acute inflammation :
  - Heat
  - Redness
  - Swelling
  - Pain
  - Loss of function



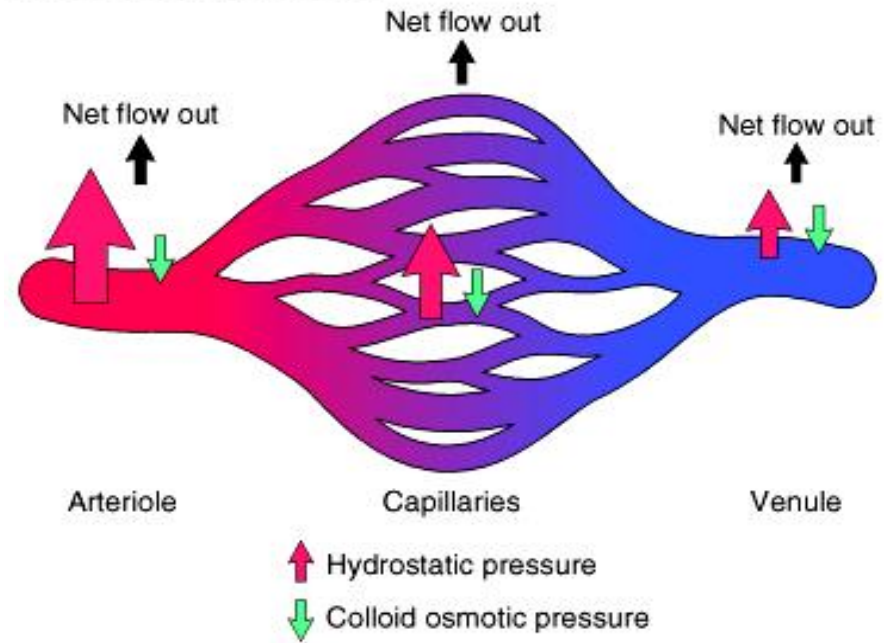
### A. NORMAL



### INFLAMED

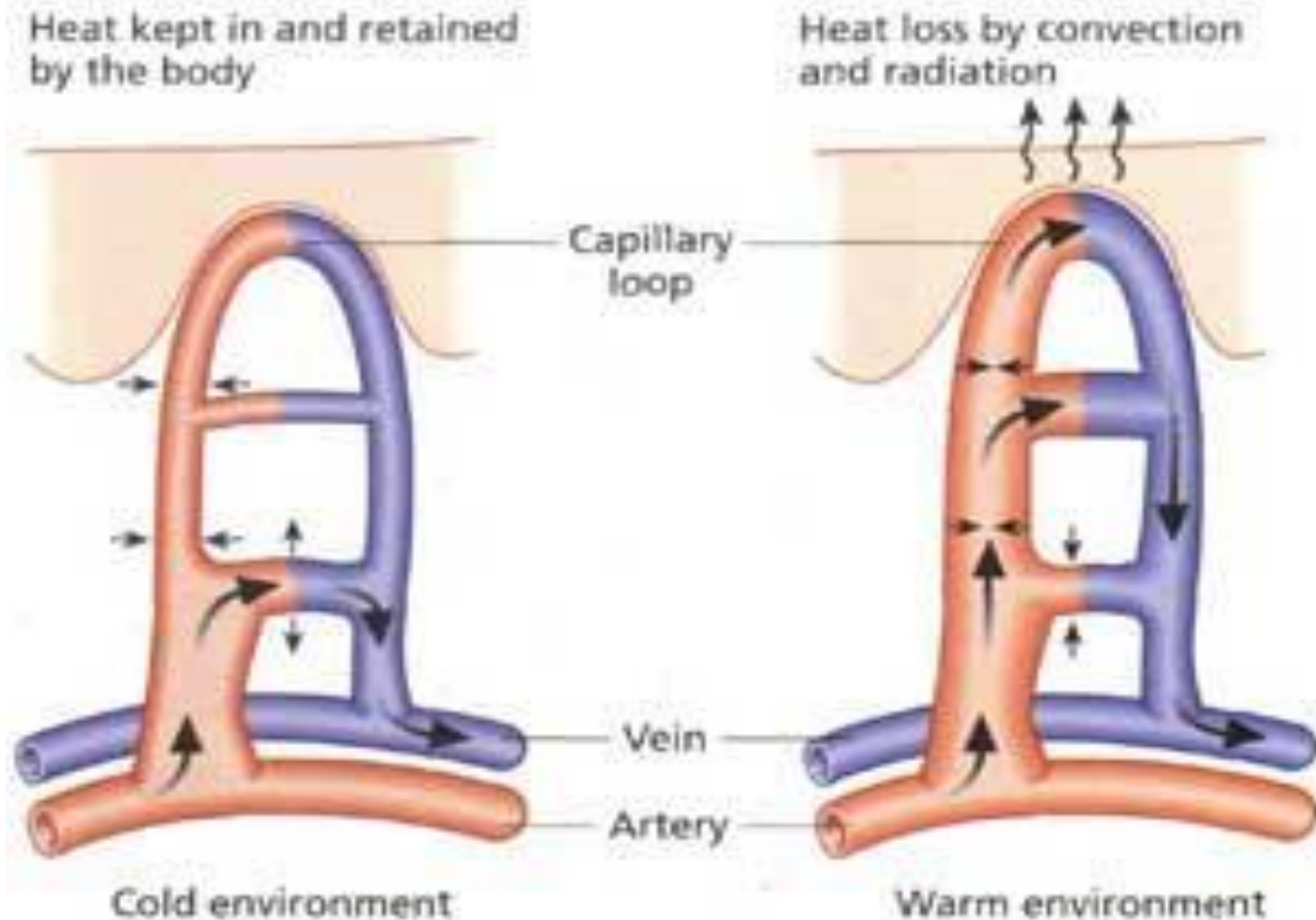


### B. ACUTE INFLAMMATION

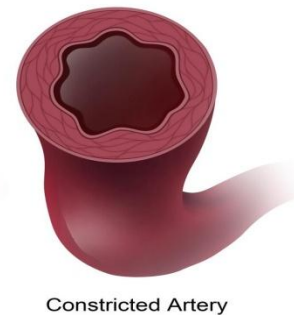
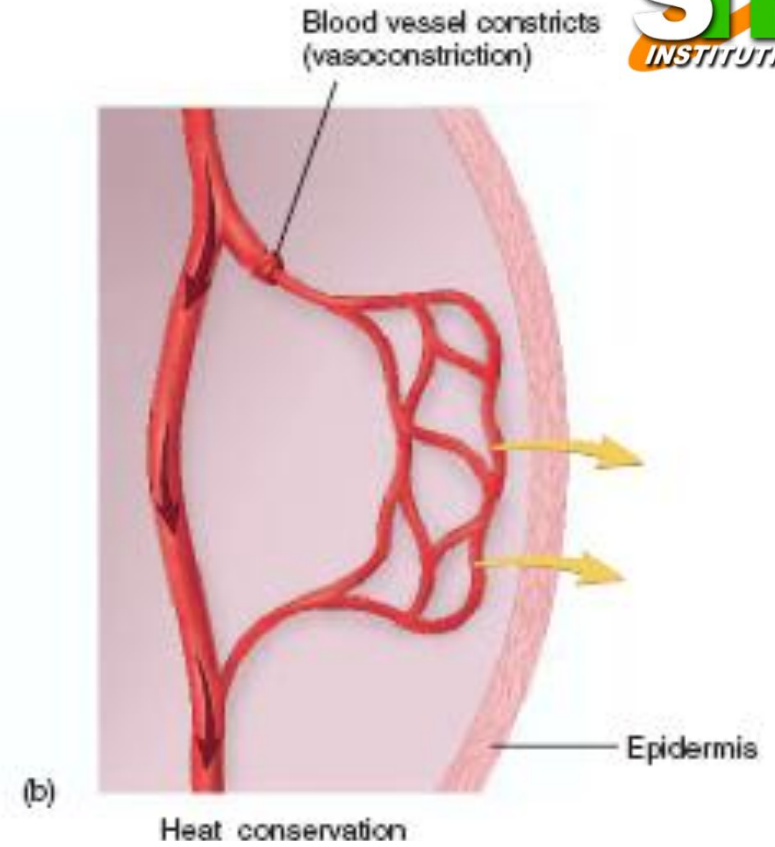
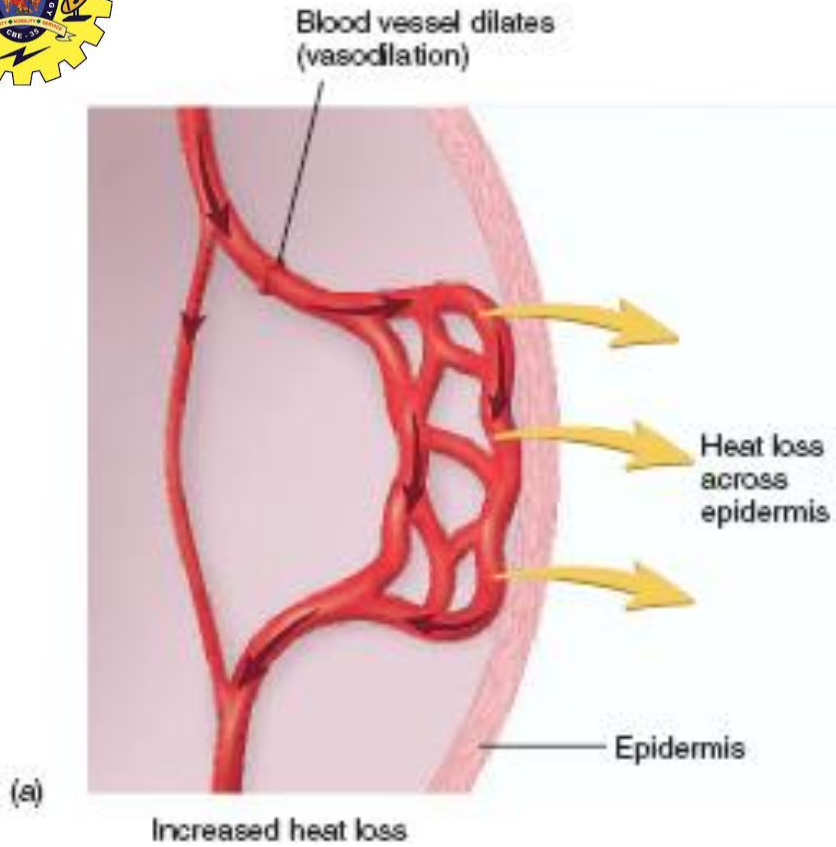




# Vasoconstriction and Vasodilatation









# Commonly used modalities

- Temperature modalities
  - Cryotherapy - ice
  - Heat
    - Superficial – hot packs
    - Deep – Ultrasound
- Electrical stimulation
  - TENS
  - NMES



# Cryotherapy

- Why Ice?
  - Mild cooling often used in an effort to control:
    - Inflammation
    - Pain control
    - Reduce spasticity

Spasticity is usually caused by damage to nerve pathways within the brain or spinal cord that control muscle movement)





# Effects of Cold on Application Site

- Vasoconstriction
- Decreased Rate of Cell metabolism resulting in a decreased need for oxygen
- Decreased production of cellular wastes
- Reduction of inflammation
- Decreased Pain
- Decreased Muscle Spasm



# Cryotherapy

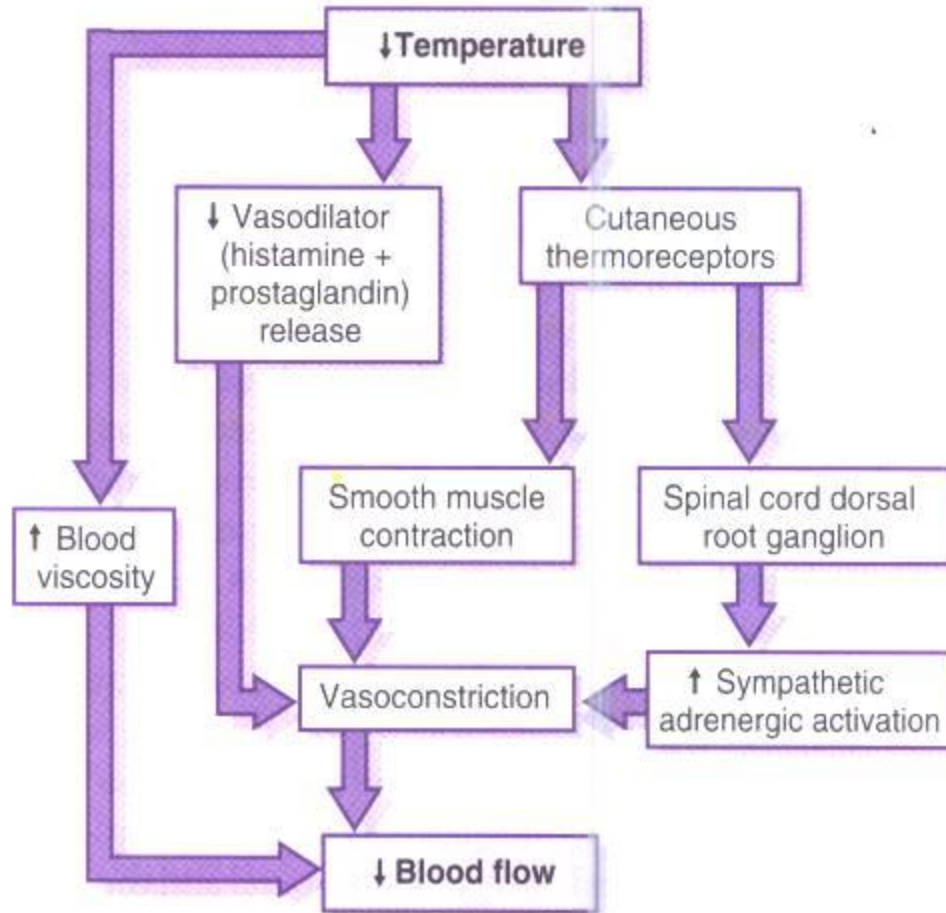


FIGURE 6-2. How cryotherapy decreases blood flow.



# Ice

- Vasoconstriction
  - Immediate vasoconstriction
  - 10-15 minutes
- Slows the acute inflammatory response
  - Reduced tissue temperature
    - Slows rate of chemical reactions
- Immediate application
- Reduces pain



# Types of Cryotherapy

- Ice Bag: 20 minute average
- Chemical Ice Pack: 20 minute average, use barrier
- Ice Bucket: 15 minute average, use a toe cover
- Cold Whirlpool: 50-55 degrees, 10-15 minutes
- Ice Massage: 7-10 minutes
- Cold Spray



# Cryotherapy (cold therapy)

- Cold Packs
  - 10-15 min
  - Keeping ice on too long can cause burning of the skin





# Cryotherapy

- Ice Massage
  - Rubbing ice over injured area
  - 5-10 min
  - Avoid bony areas
  - Move ice in a continuous circular motion







# Cryotherapy

- Cold Whirlpool/Immersion
  - 50-65 degrees
  - 5-15 minutes
  - Thermal barriers can be used
  - Disadvantage: injured part is in a non-elevated position
  - Offers a massaging effect





# Cryotherapy

- Cold Spray (ethyl chloride)
- Apply no longer than 10 seconds
- Not as effective as cold treatments
- Only cools skin surface

