

Non-Surgical Technology

HIFU (High Intensity Focused Ultrasound)

- Focustion (45mm) Frequency (3MHz) Impulse-delay relation (5-7 sec to 4-5 sec)
- Power (50Watt) Focus temp (85°C) / Contact free

Mechanism

1. Focal Ablation

- Acoustic wave absorbed and converted to heat, causing coagulation
Formation of micro-bubble and then implode, leading to shock wave and jets that can mechanically damage tissue

2. Immunotherapy

- Activate anti-tumour immunity / Increase infiltration of activated tumour lymphocyte

3. Drug Delivery

- Increase the permeability of cells Delivery of liposomal doxorubicin in breast cancer
- HIFU for Ca Prostate - Localised/ Salvage after EBRT

Cryotherapy

- Rapid freezing (-40°C) of target tissue
- Argon or nitrogen are the cryogens most commonly used
- Effect usually extends 1 cm beyond the lesion margin

Mechanism level:

- Causes direct cell damage and ice formation
1. Extracellular osmotic concentrations change
 2. Cell membranes dysfunction
 3. Disrupted cell integrity
 4. Impair tissue microvasculature by vasoconstriction
 5. Endothelial damage
 6. Micro-vascular thrombosis
 7. Tissue ischemia

RFA (Radio Frequency Ablation)

- Transmitting a high-frequency electrical current through an electrode placed direct into the target tissue
- Alternating current causes ions in the surrounding tissues to vibrate, creating frictional heat that results in heat-induced tissue damage
- Electrode temperatures between 50°C and 100°C

Three phases of tissue destruction:

1. Molecular friction destruct cellular structure, protein denaturation, membrane lipid melting, and cellular vaporization
2. Coagulative necrosis with surrounding areas of cellular edema and inflammation is evident and leads to tumour destruction
3. Final evolution of the ablated tissue is re-absorbed, resulting in fibrotic scar

TUNA (Trans Urethral Needle Ablation)

- Interstitial Radiofrequency (RF) needles through the urethra and lateral prostate lobes
- Mechanism is via Heat-induced coagulation & necrosis
- Gland is heated to 110°C, at an RF power of 456 kHz for approximately 3 minutes per lesion