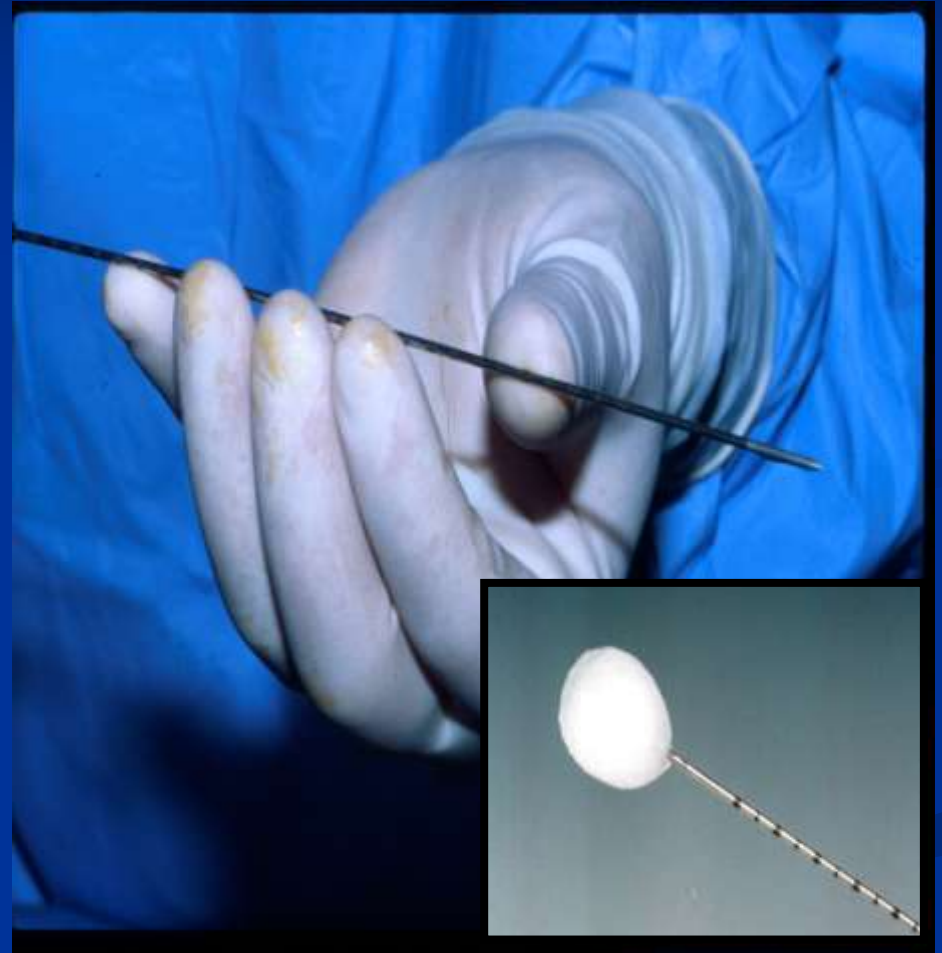
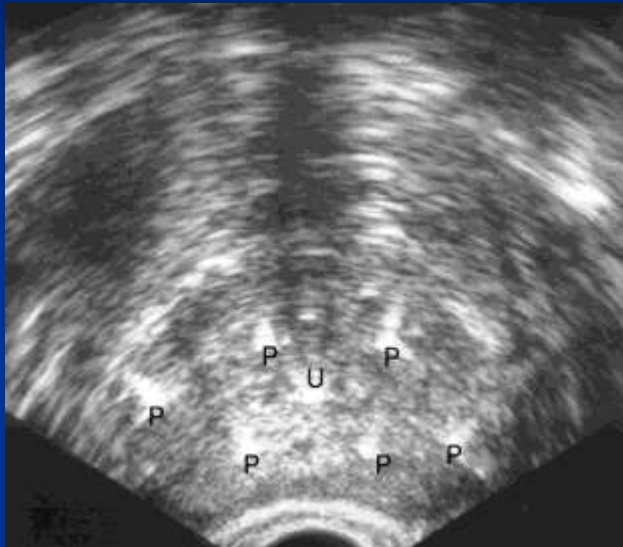
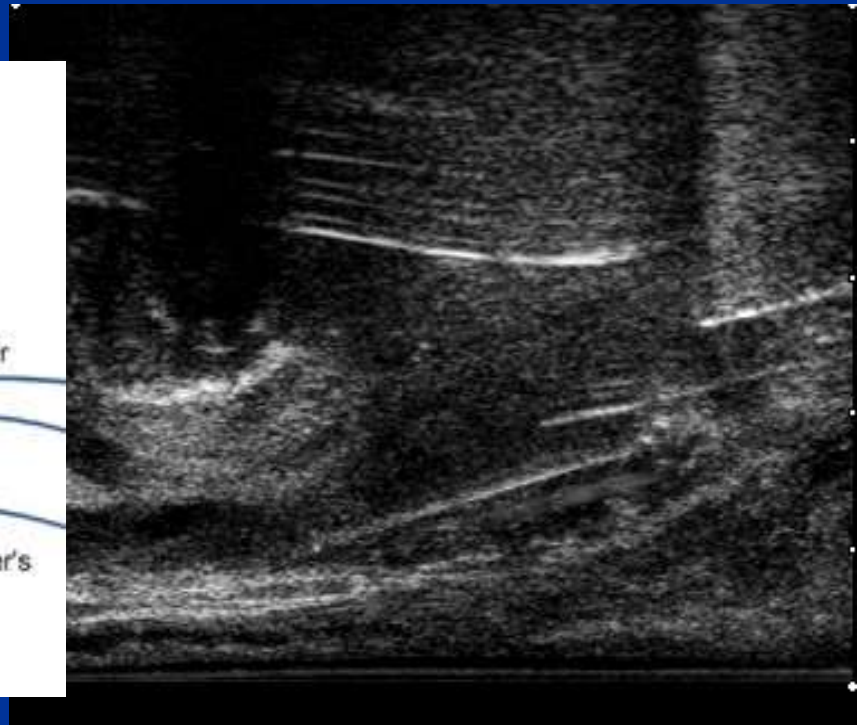
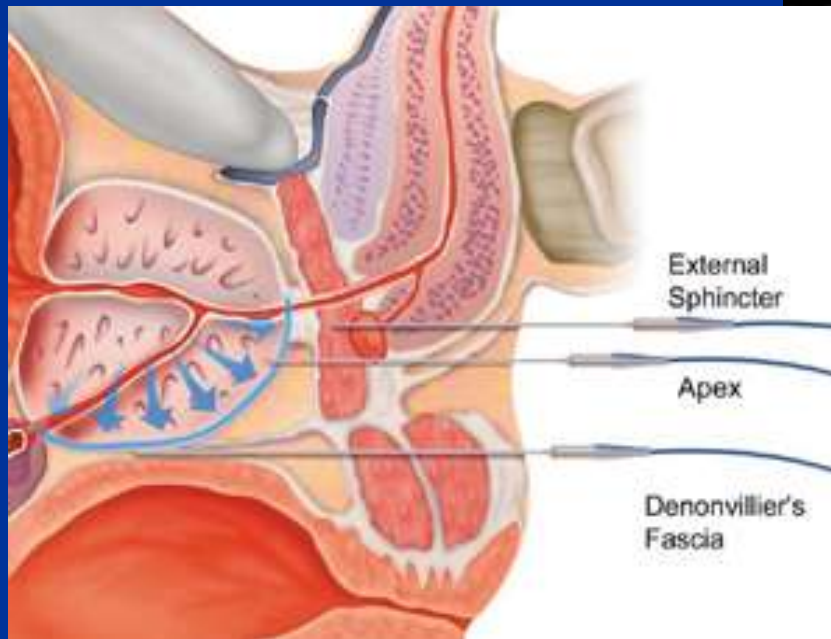


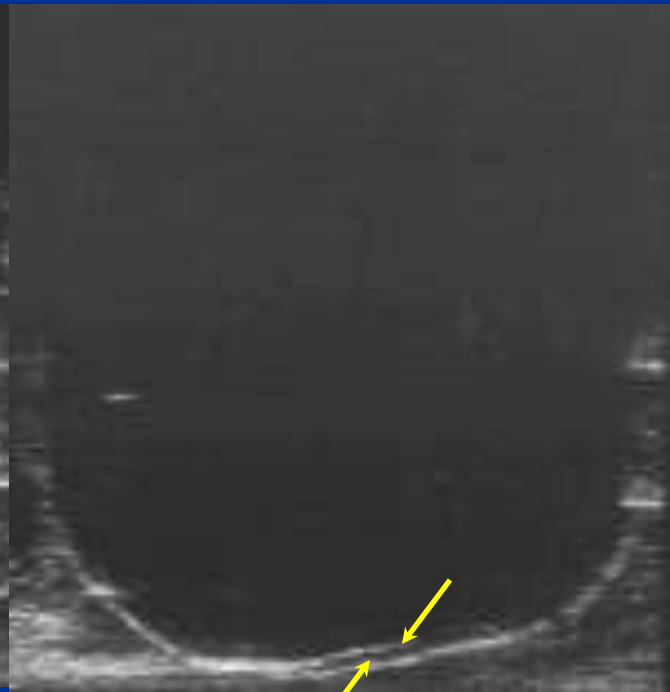
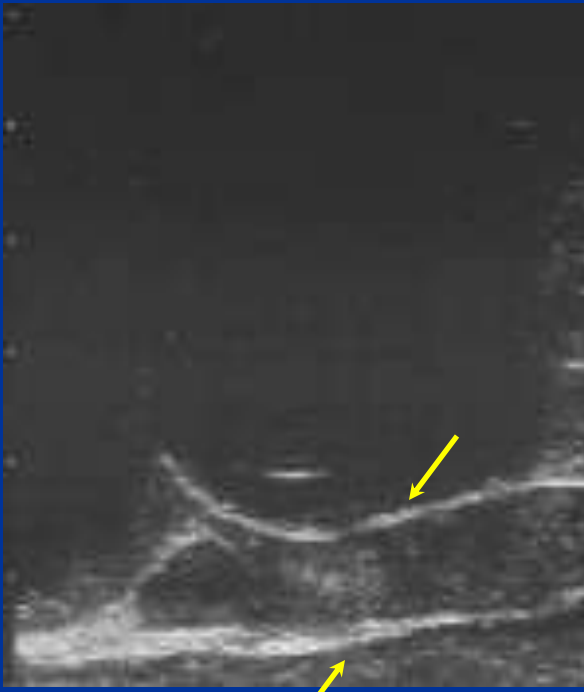
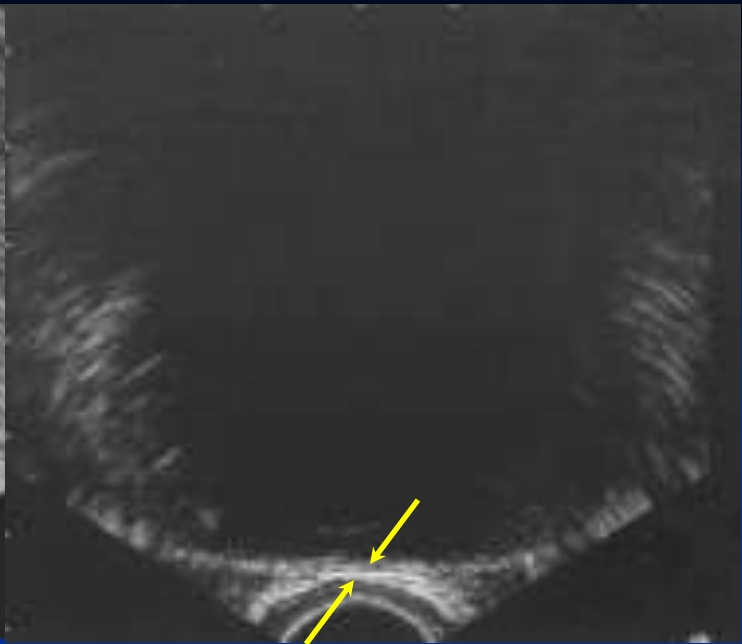
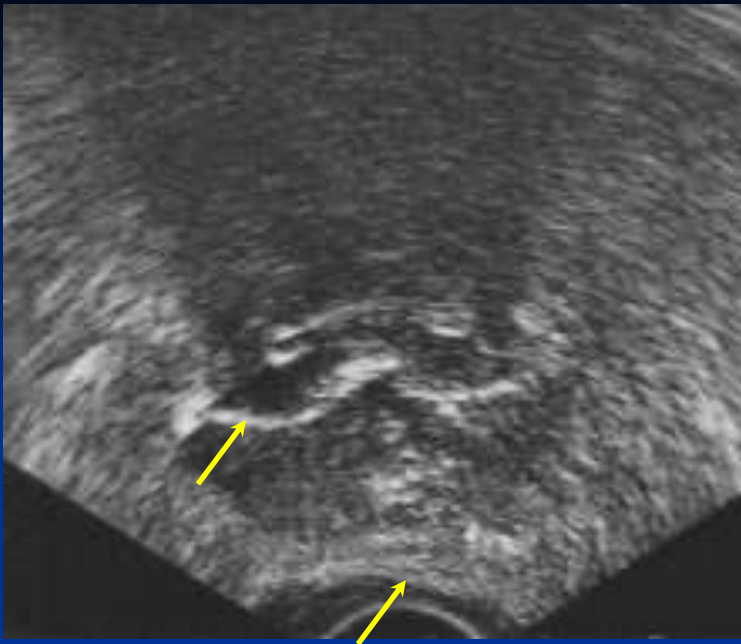
# Cryoablation of the prostate



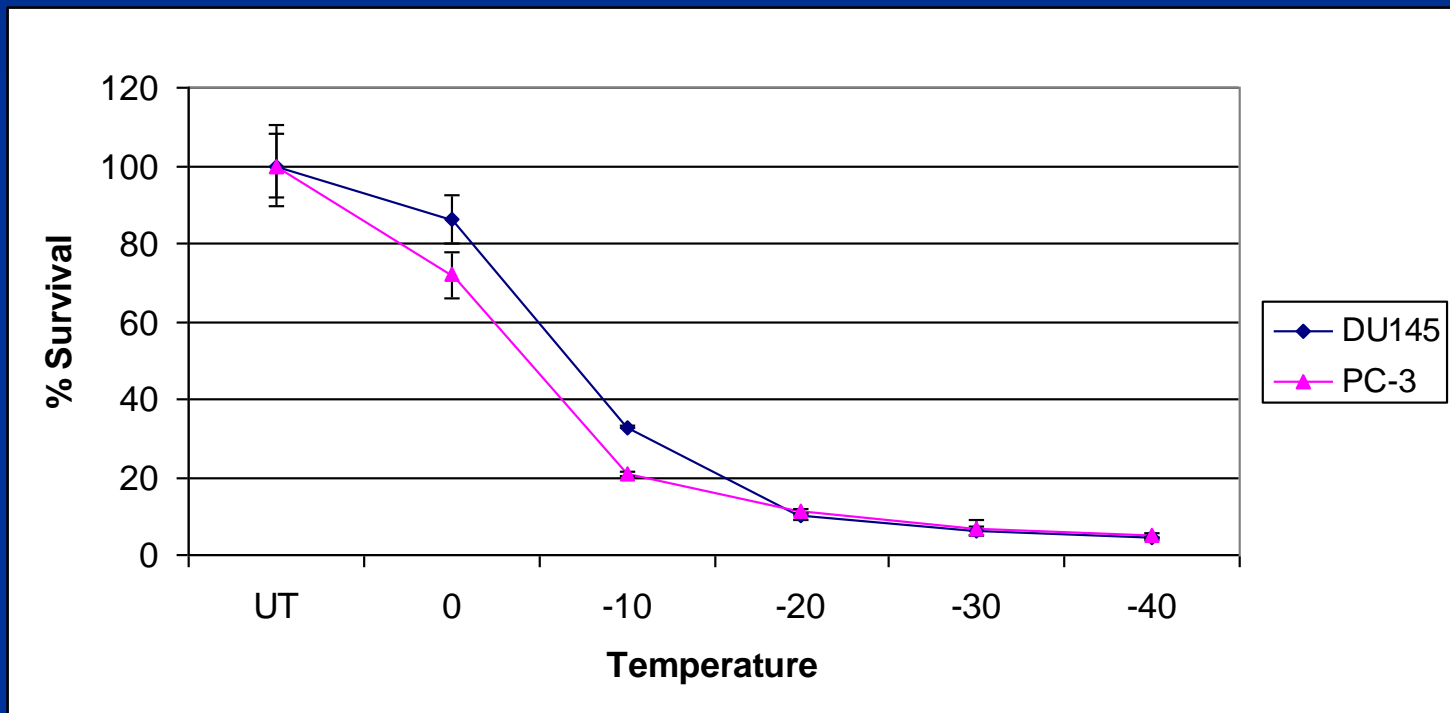
# Thermocouples

- External sphincter
- Apex
- Denonvilliers fascia





# Prostate cancer cell resist freezing down to - 40°C

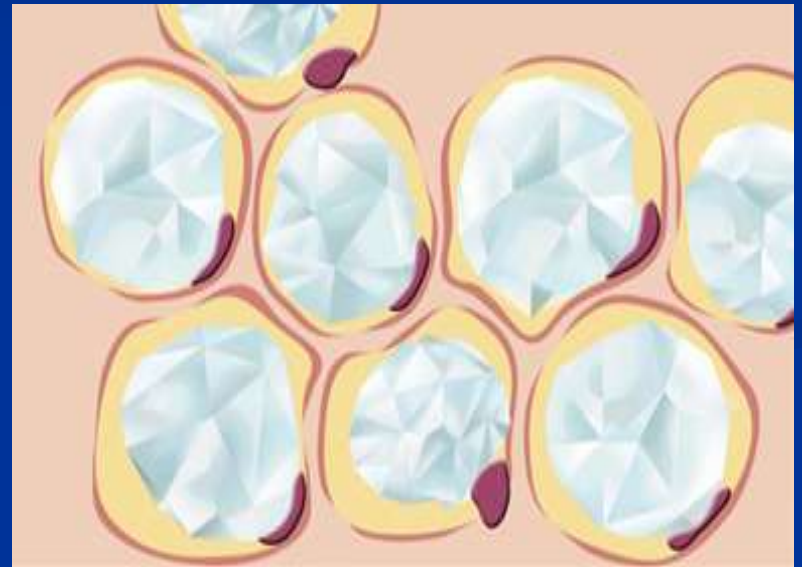


# Cryobiology

## Intracellular Cell Damage

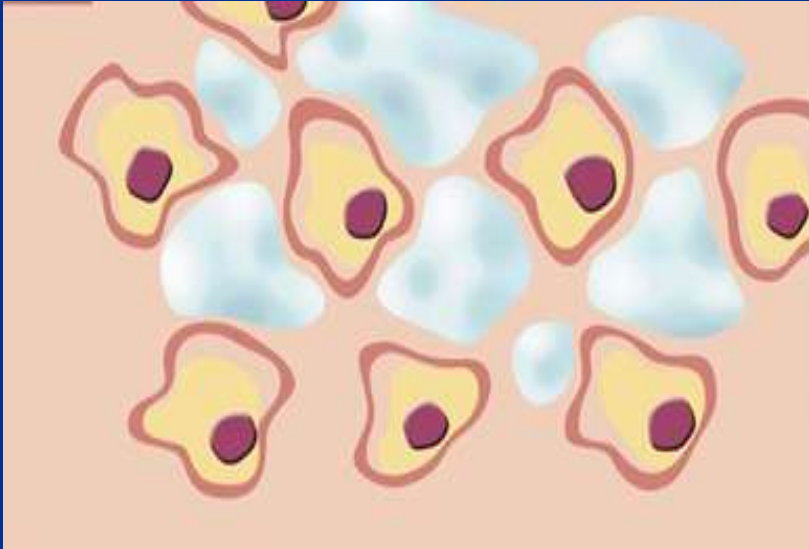
### INTRACELLULAR ICE FORMATION

Intracellular ice formation results in disruption of organelles, cell membranes and cell death.



# Cryobiology

## Extracellular Cell Damage

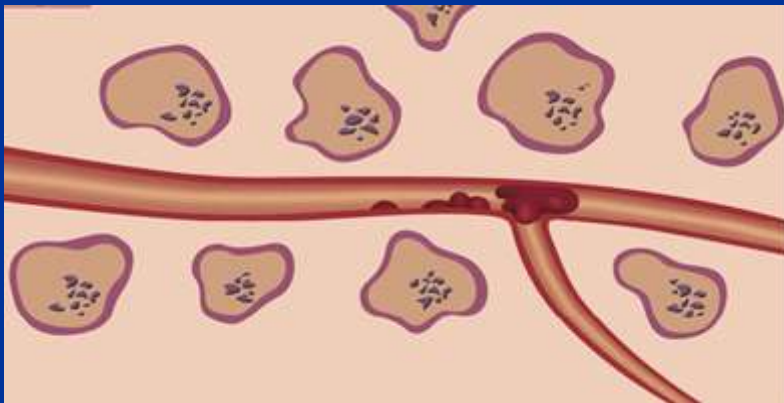
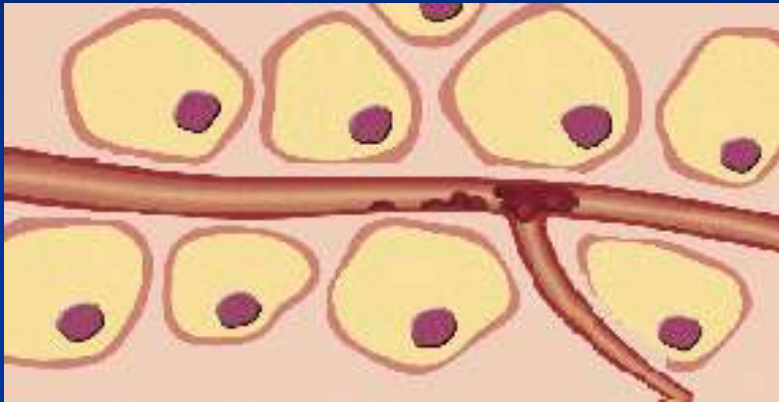


### CELL DEHYDRATION

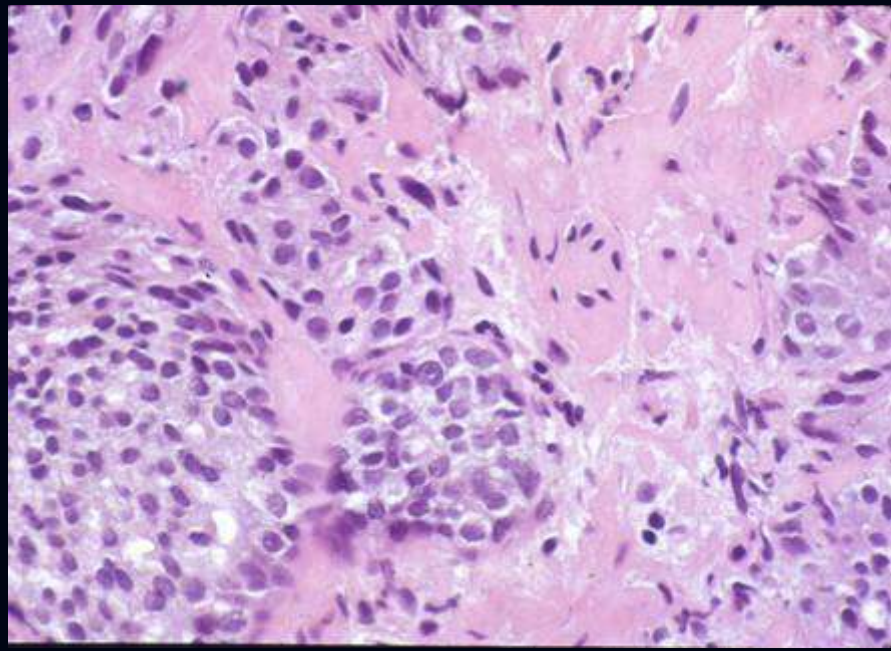
Extracellular ice crystal formation causes a hyperosmotic extracellular environment that dehydrates cells and damages cell constituents.

# Cryobiology

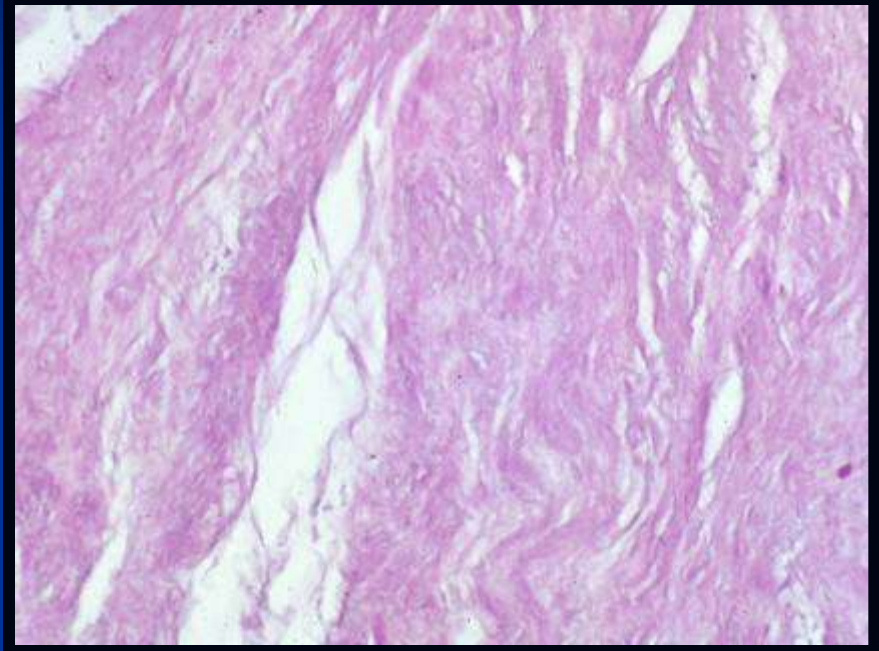
## Vascular Stasis



- Vasoconstriction.
- Vasodilatation.
- Thrombus formation
- Oedema.
- Tissue necrosis.



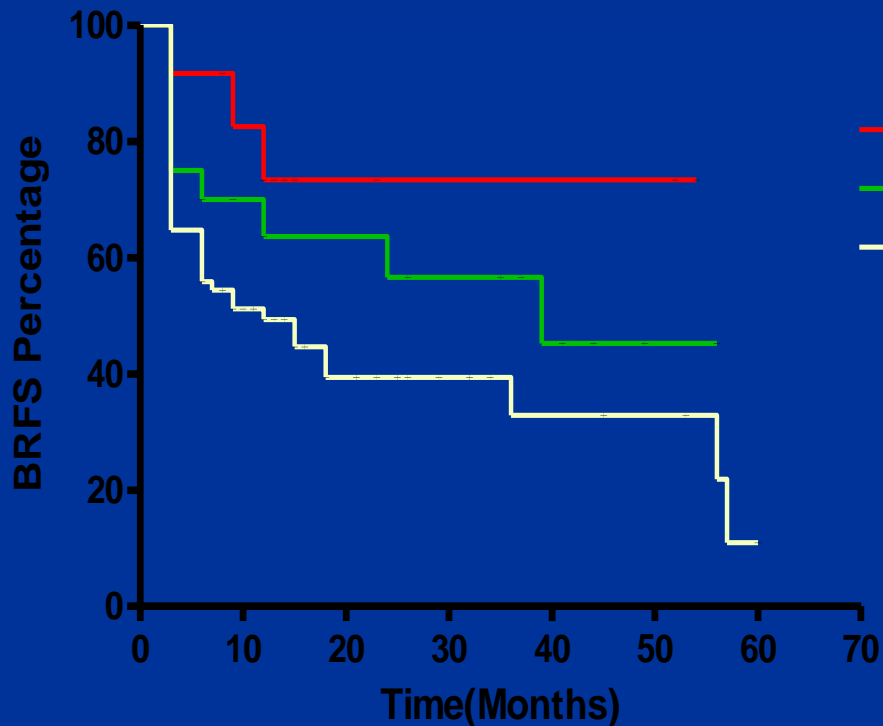
**Adenocarcinoma of the prostate**



**Post Cryotherapy  
Coagulative Necrosis**

# Cryosurgery for Post EBRT Recurrence

## BRFS by risk group



■ The 5 years actuarial BRFS using a PSA threshold of  $< 0.5$  ng/ml was:

- Low risk group 73%
- Intermediate risk 45%
- High risk group 11%

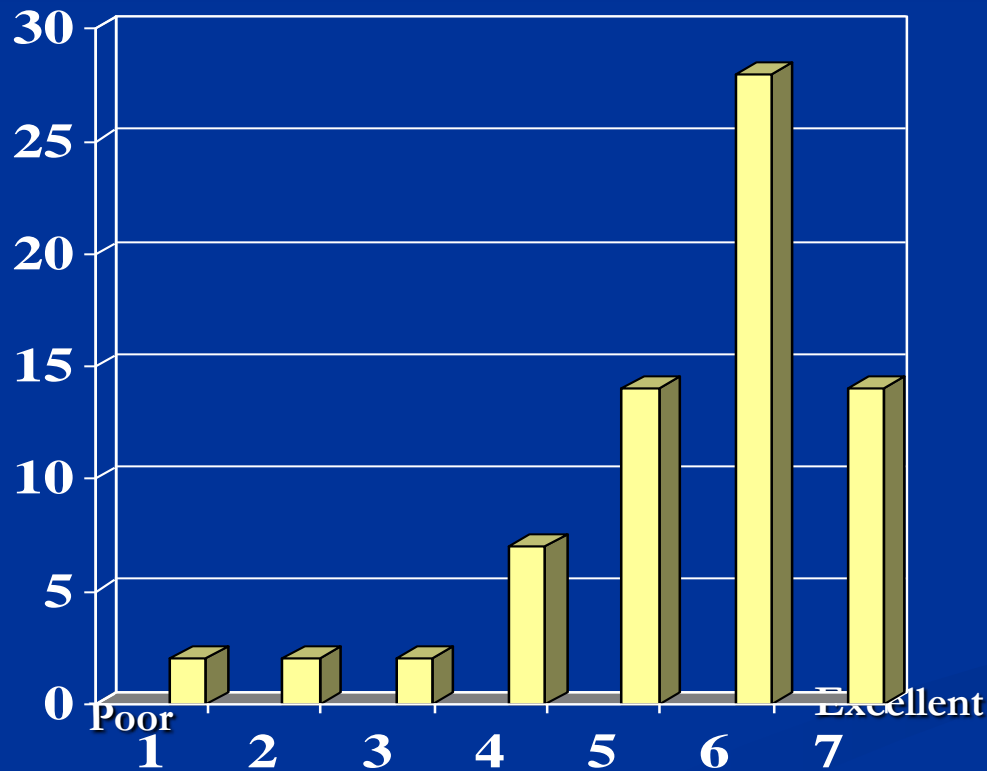
P= 0.0447

# Cryosurgery Post EBRT

## Recurrence

## Quality of life

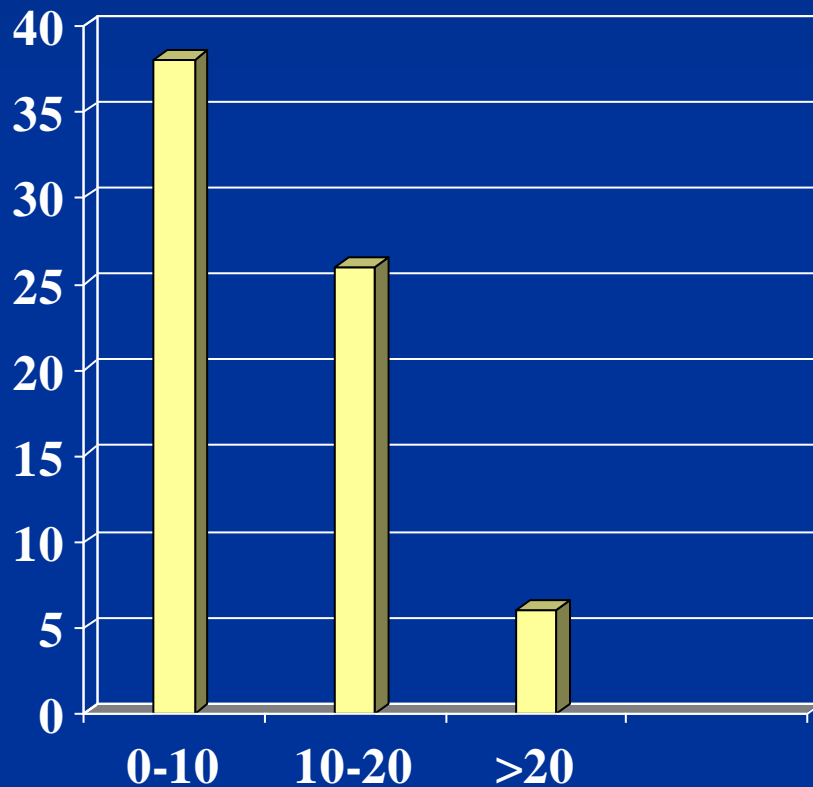
(EORTC QLQ C30 v3)-(EORTC QLQ-PR25)



- The question was rated on a 7 point scale ranging from 1 (poor) to 7 (excellent).
- 81% patients rated their quality of life > 4.

n=69

# Cryosurgery Post EBRT Recurrence IPSS score

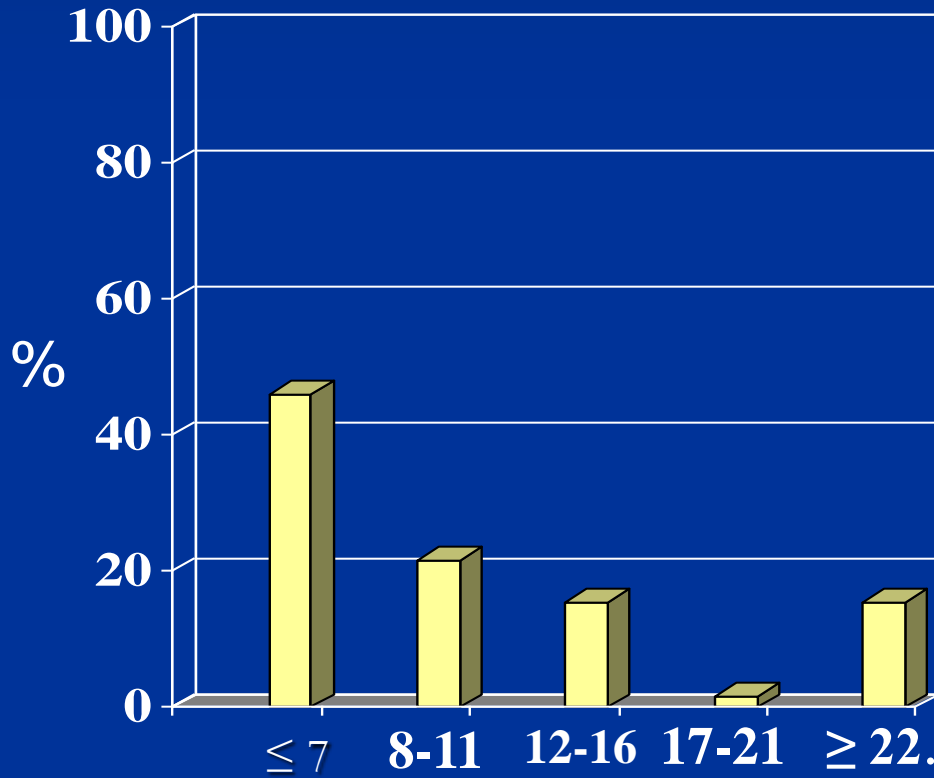


- Preoperatively, the median IPSS was 7 (range 1 to 27)
- Postoperatively, the median IPSS was 13 (range 0 to 34).

n=70

# Cryosurgery Post EBRT Recurrence

## International Index of Erectile Function (IIEF)

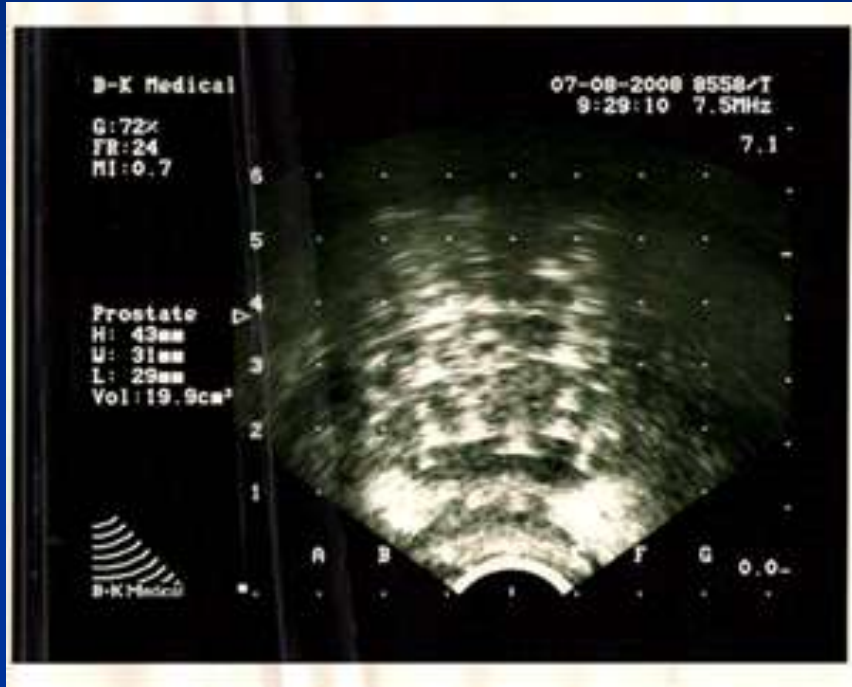


- 46% patients score  $\leq 7$ ,
- 21.5% between 8 and 11
- 15.4% between 12 and 16
- 1.5% between 17-21
- 15.4% patients  $\geq 22$ .

IIEF

n=65

# Post-Brachytherapy Recurrence



# Salvage Cryosurgery Post-Brachtherapy Patient Selection

- ASCO Criteria
- Biopsy confirmed – 7 Perineal Template, 6 TRUS Guided
- Bone scan Negative
- TRUS Volume  $> 10 < 40$  ccs
- IPSS  $< 15$
- No TURP

## Salvage Cryosurgery Post - Brachytherapy

- Phosphate enema
- GA, O/N stay
- IV antibiotics
- Aerated Gel catheter
- TRUS Guided Cryoneedles and thermocouples
- Flexible Cystoscopy and warming catheter (42c)
- Double Freeze-Thaw Cycles
- Home with catheter 2/52 and antibiotics

## Salvage Cryosurgery Post-Brachytherapy

- 13 cases – None on hormonal therapy
- Age Range 51 – 69 years
- Histopathology – Recurrent adenocarcinoma, gleason grade not recorded
- PSA 2.4 – 11
- Time to failure 18 – 38 months
- IPSS 7 -18
- Prostate volume 13 -34 ccs

# Salvage Cryosurgery Post - Brachytherapy

## Results and complications

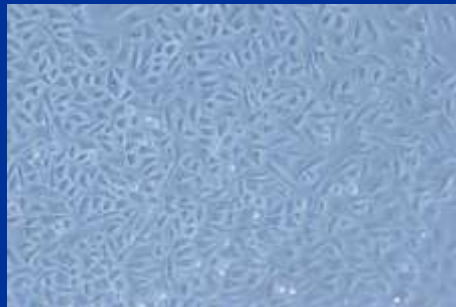
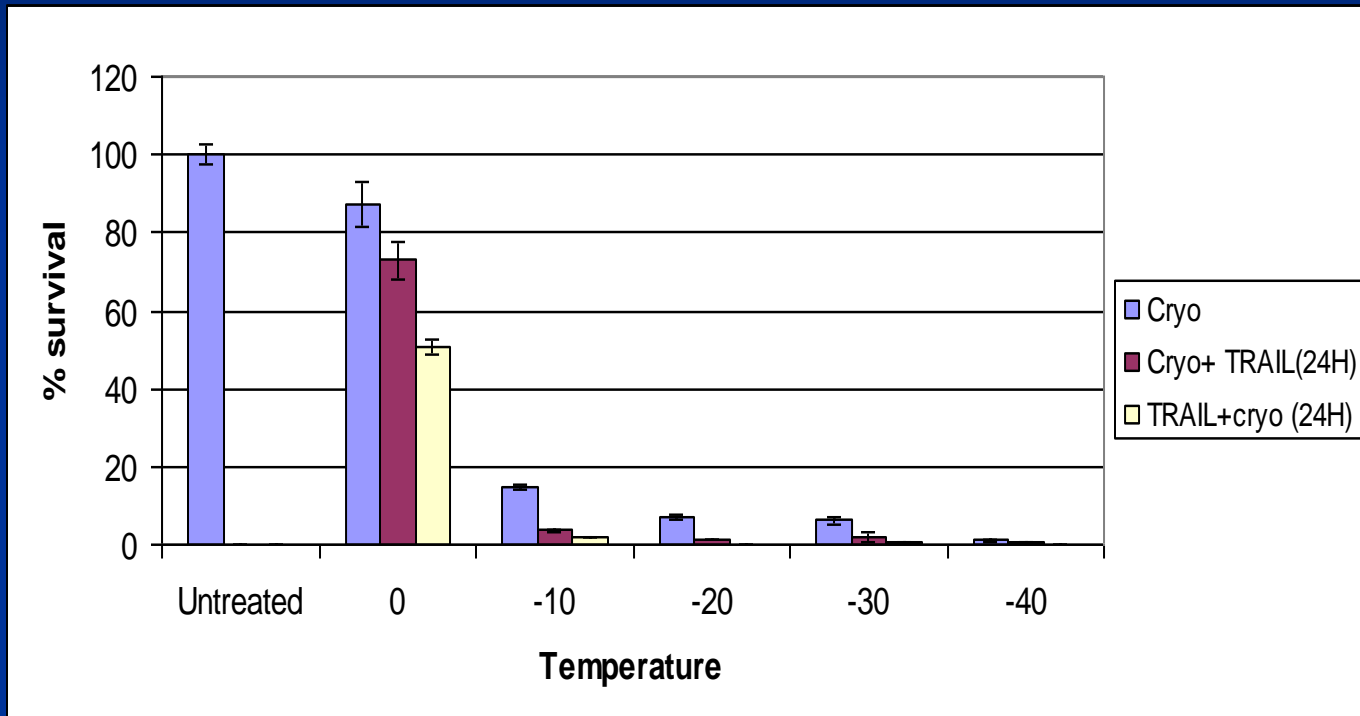
- 8 cases PSA < 1 at 24 months
- 5 cases PSA continued to rise despite cryo
- No fistulas
- 4 AROU, all resolved
- Significant LUTS in all, 2 – 15 weeks, managed medically
- Significant ED in all, all managed medically

# Salvage Cryosurgery Post – Brachytherapy

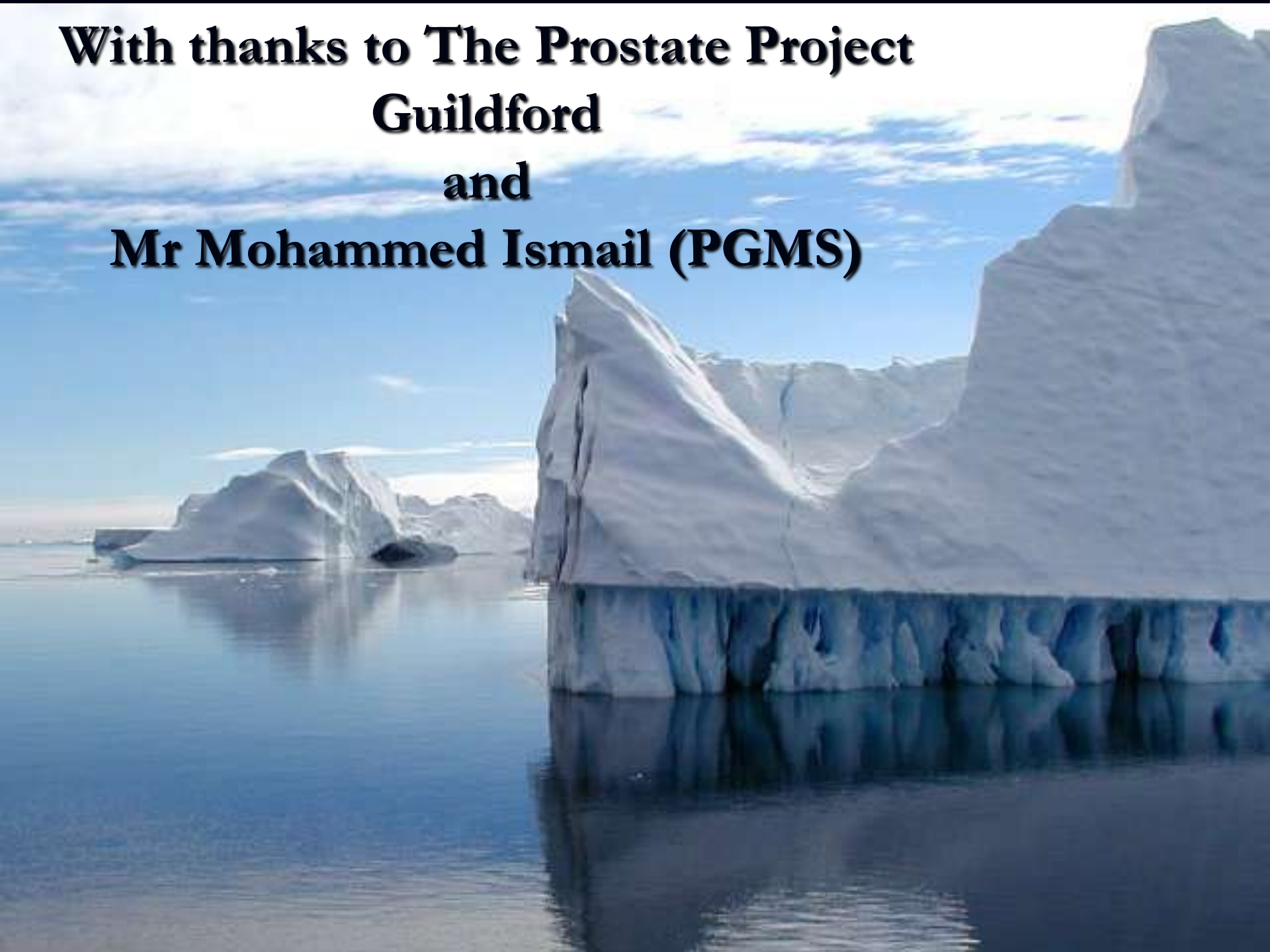
## Conclusions and Future Developments

- Salvage cryosurgery is a possible treatment option for post brachytherapy recurrence
- Significant potential for ED and LUTs problems post operation
- Careful patient selection and counselling essential
- Perineal biopsy preferable to TRUS guided biopsy
  
- Chemosensitisation Investigation
- Focal and Hemi-ablation techniques – Tumour necrosis factor related apoptosis inducing ligand (TRAIL)
- 3 D TRUS and Intra-operative MRI
- Improved thermocouple monitoring and cryoneedle design
- Computer guided planning software

# TRAIL sensitisation



**With thanks to The Prostate Project  
Guildford  
and  
Mr Mohammed Ismail (PGMS)**



# *in vitro* cryotherapy model

