ROLE OF ULTRASOUND IN PROSTATE CANCER

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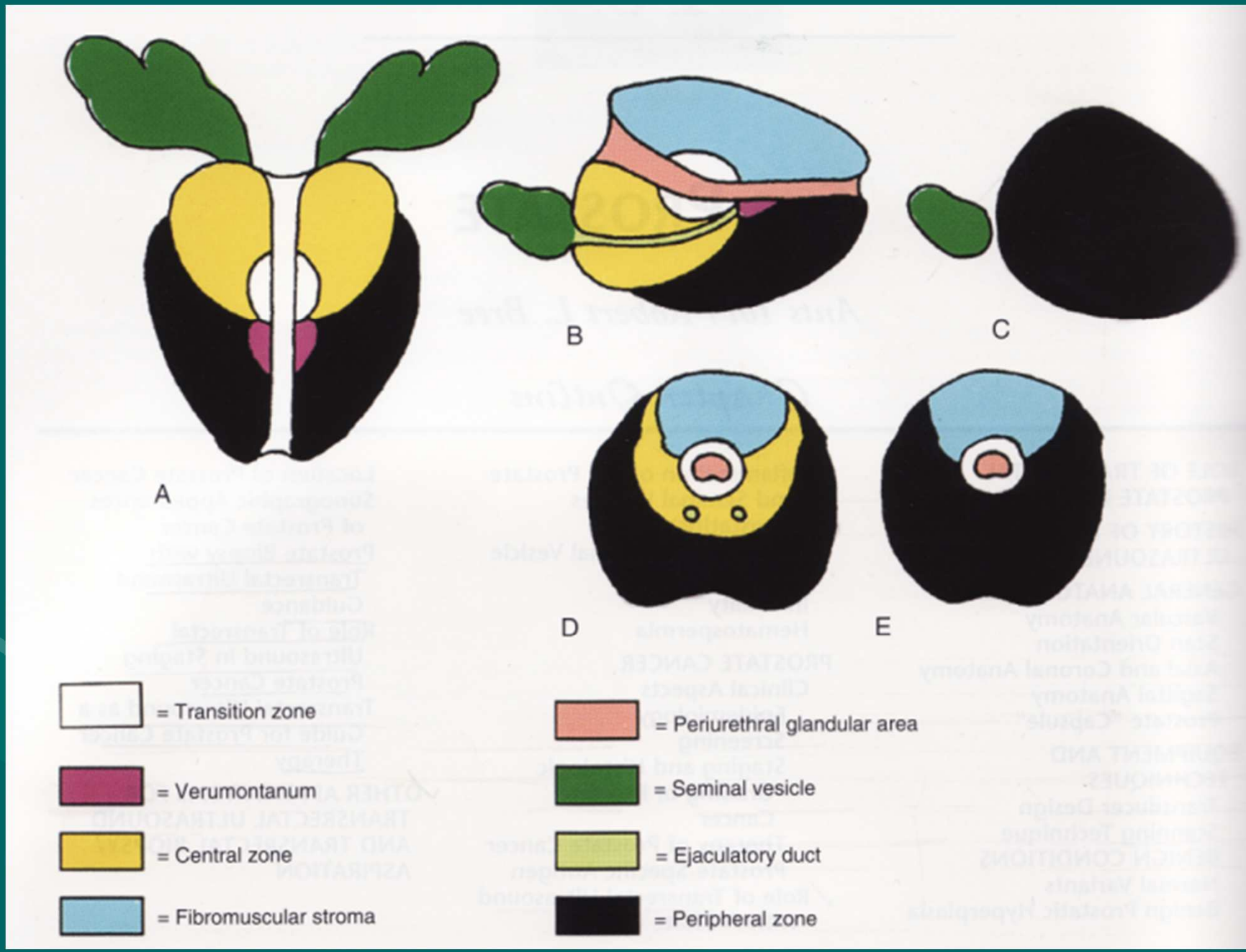
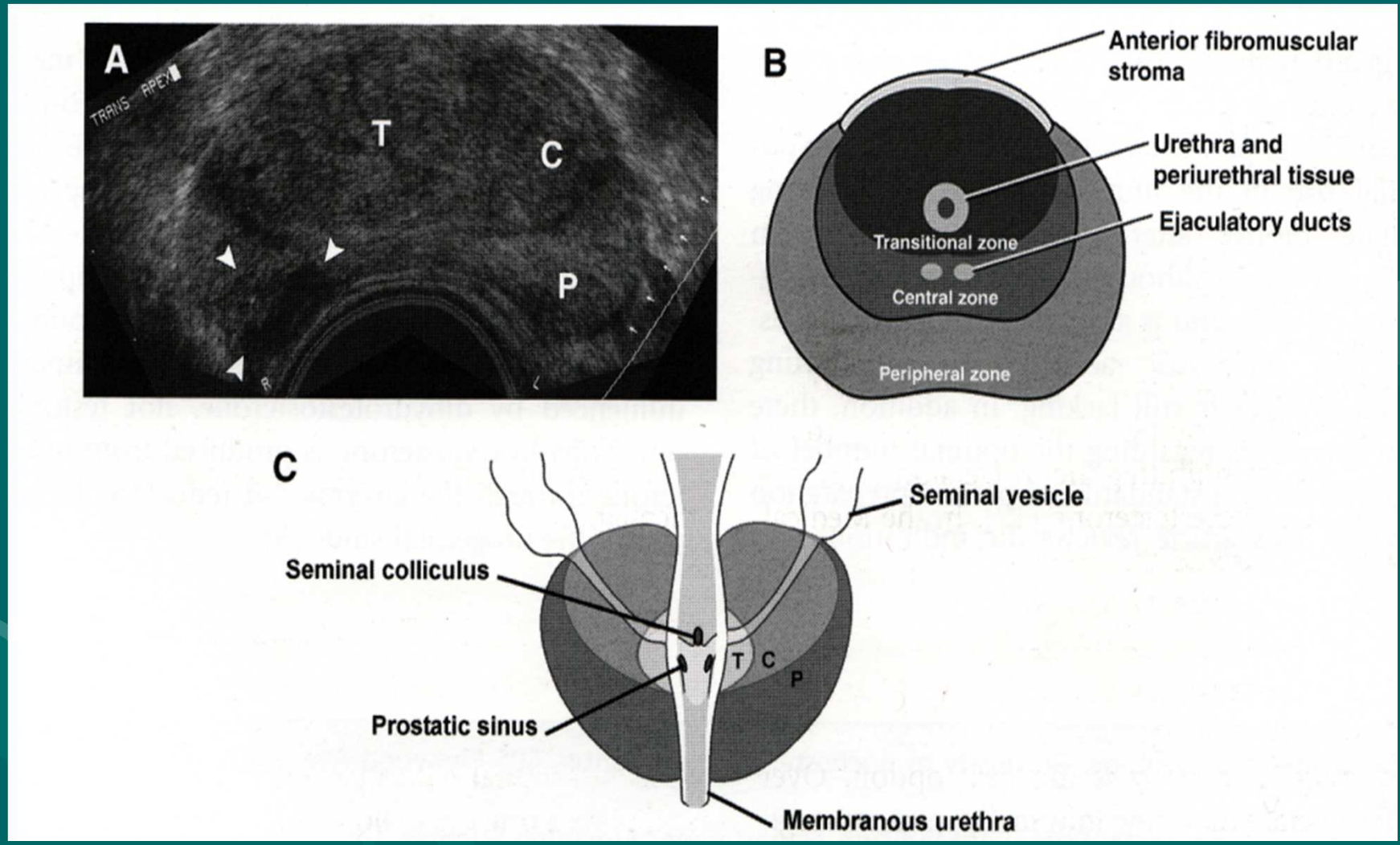
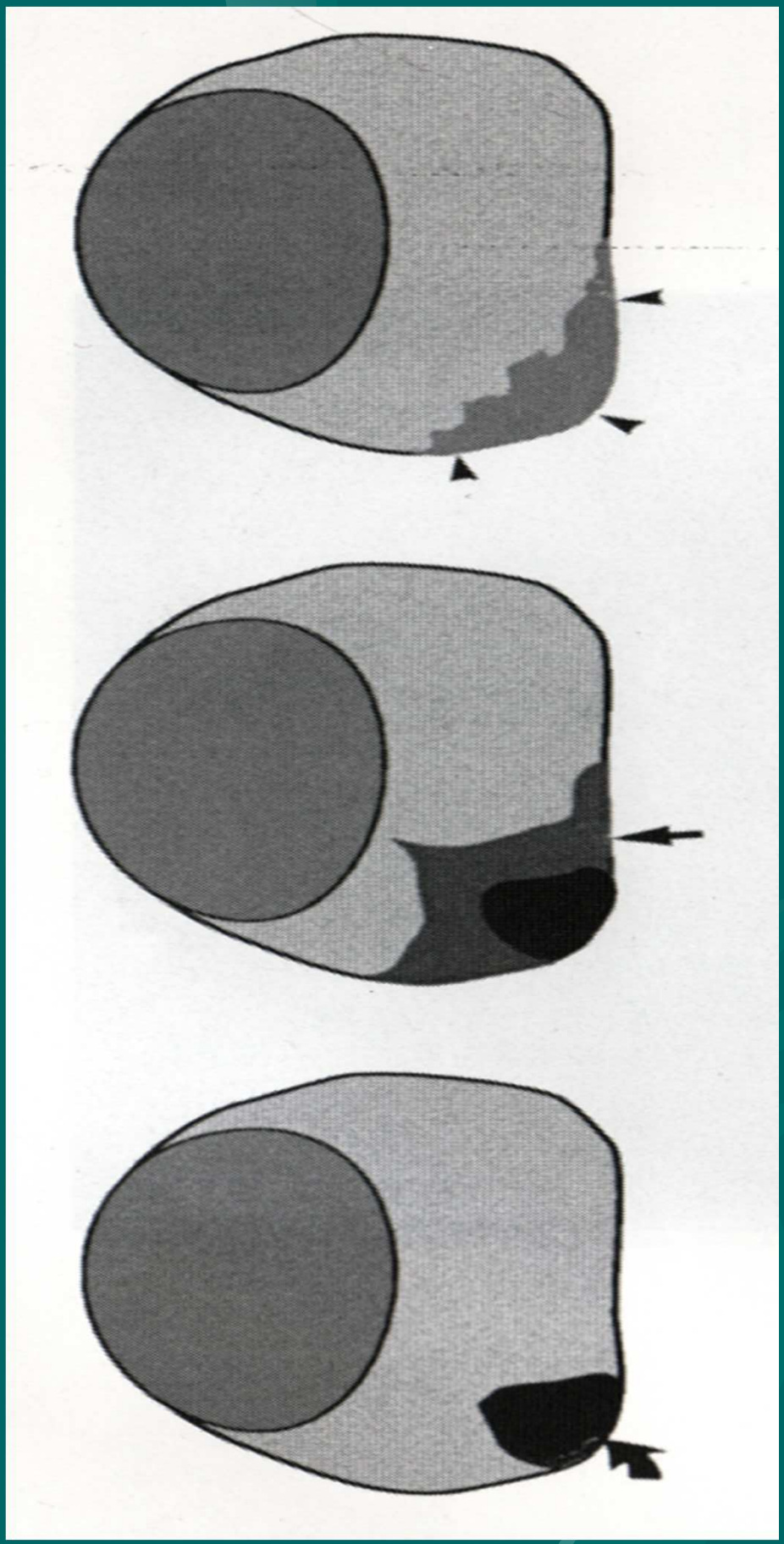
TransRectal UltraSound
(TRUS)
is one of the most valuable tools in detection and management of prostate cancer.

TRUS

1.SCREENING
2.CANCER DETECTION
3.BIOPSY GUIDANCE
4.STAGING
5.THERAPY GUIDANCE
6.MONITORING RESPONSE TO TREATMENT

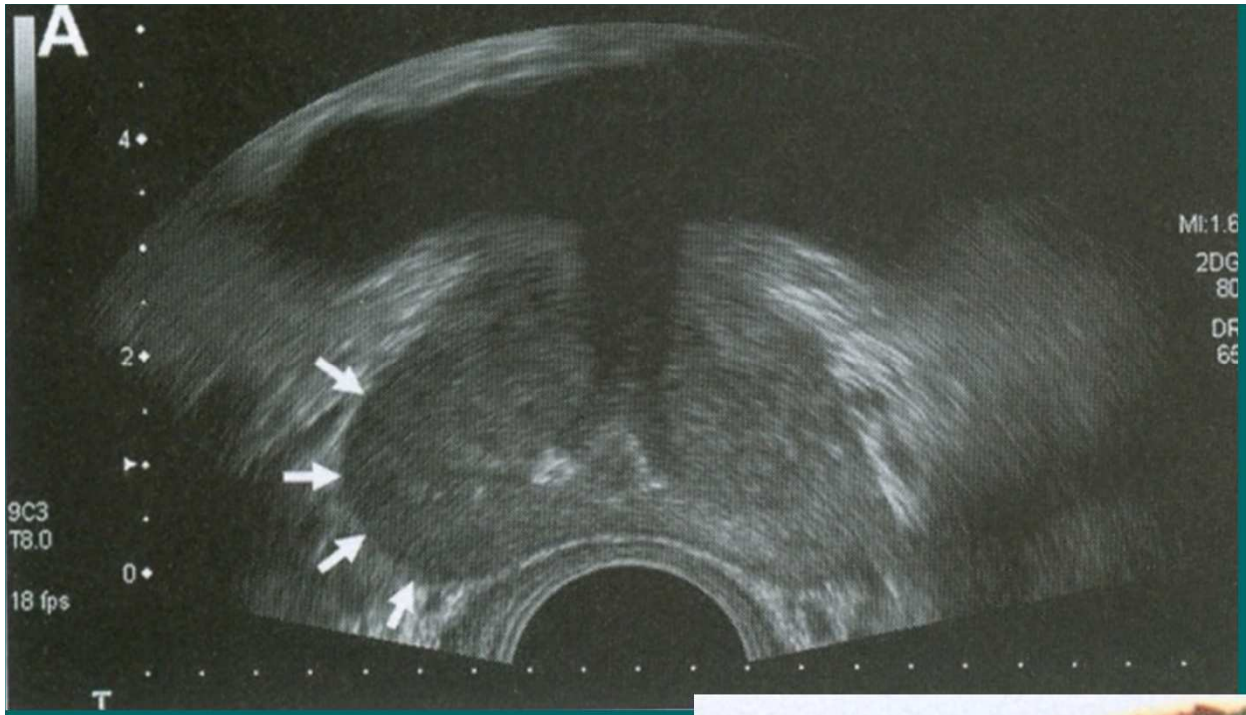

A
B
C
D
E
= Transition zone
= Verumontanum
= Central zone
= Fibromuscular stroma
= Periurethral glandular area
= Seminal vesicle
= Ejaculatory duct
= Peripheral zone

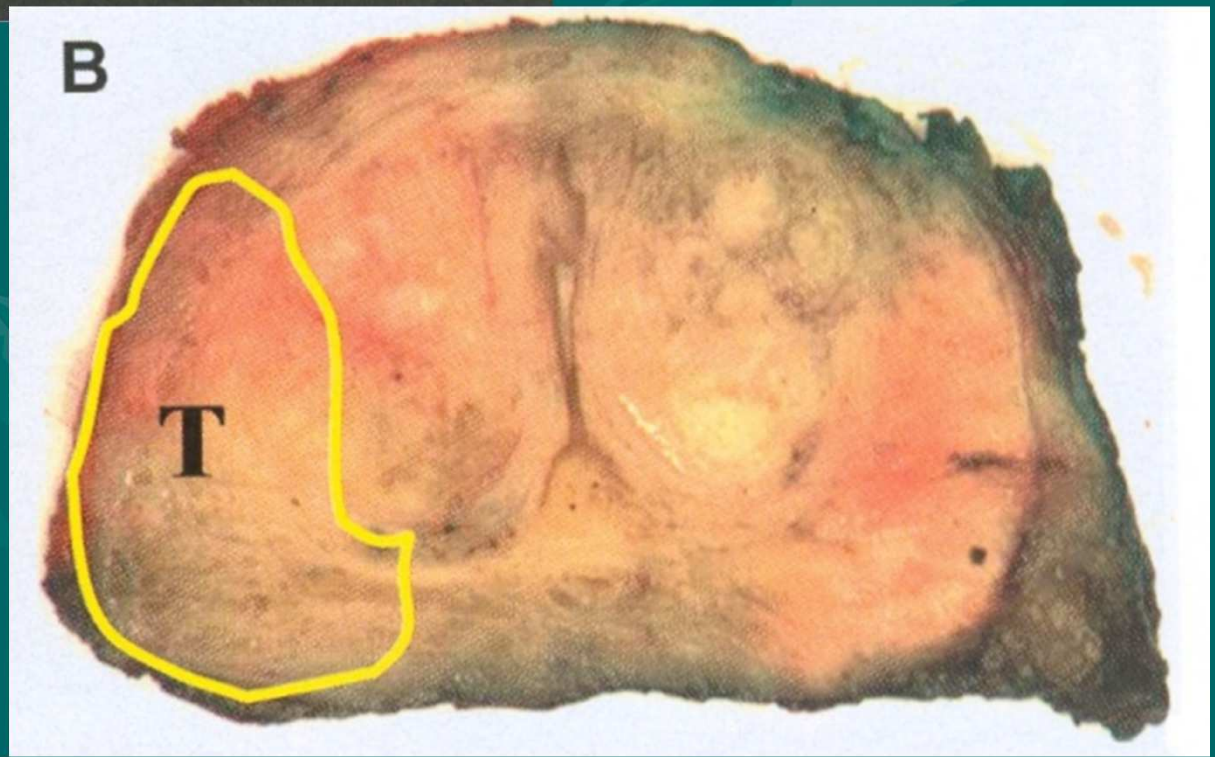

A
TRANS APEX
T
C
P
B
Anterior fibromuscular stroma
Urethra and periurethral tissue
Ejaculatory ducts
Transitional zone
Central zone
Peripheral zone
C
Seminal vesicle
Seminal colliculus
T
C
P
Prostatic sinus
Membranous urethra

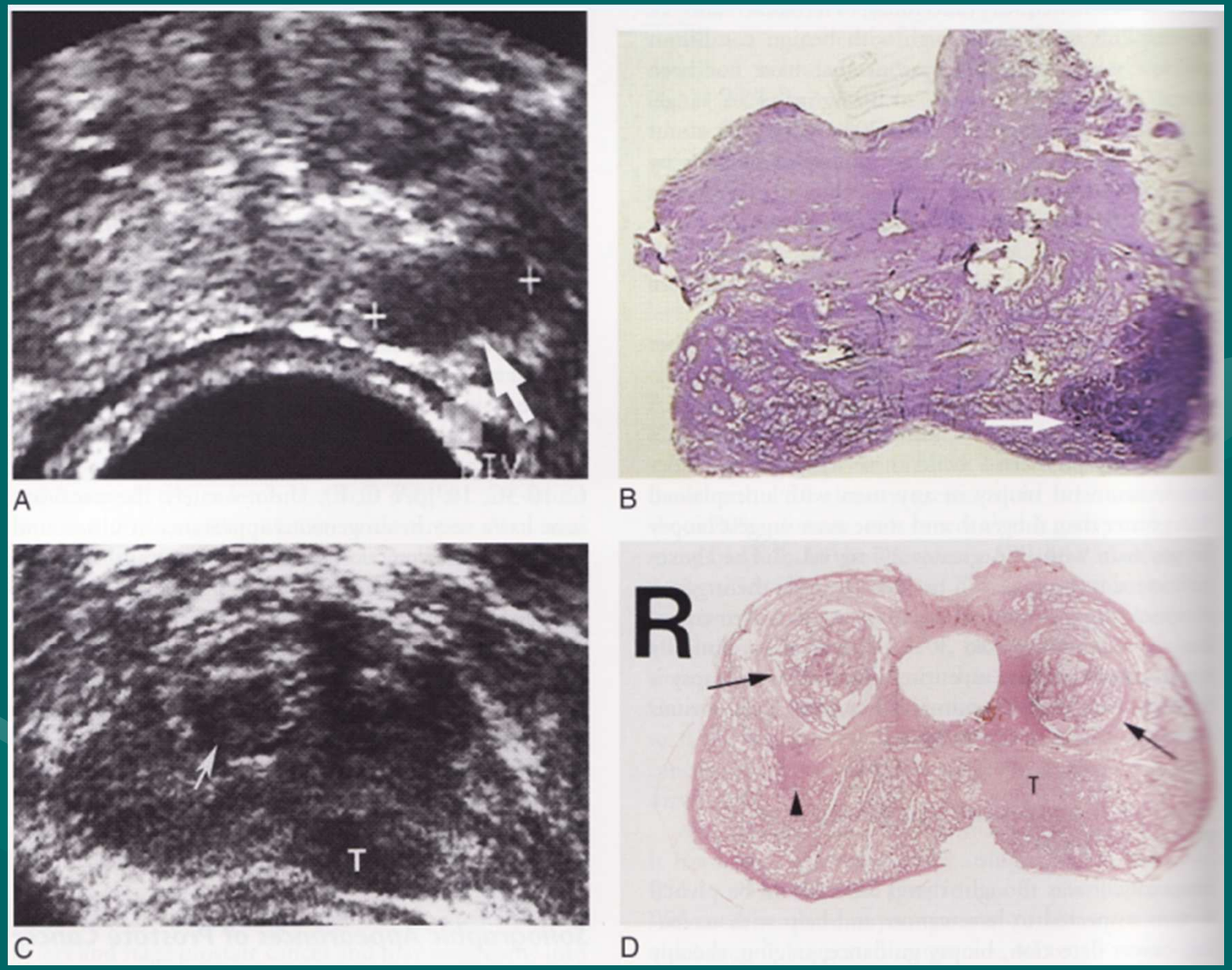


Sonographic appearances of Prostate cancer

Hypoechoic (50 % to 70 %)
Isoechoic (25 % to 30 %)
Hyperechoic

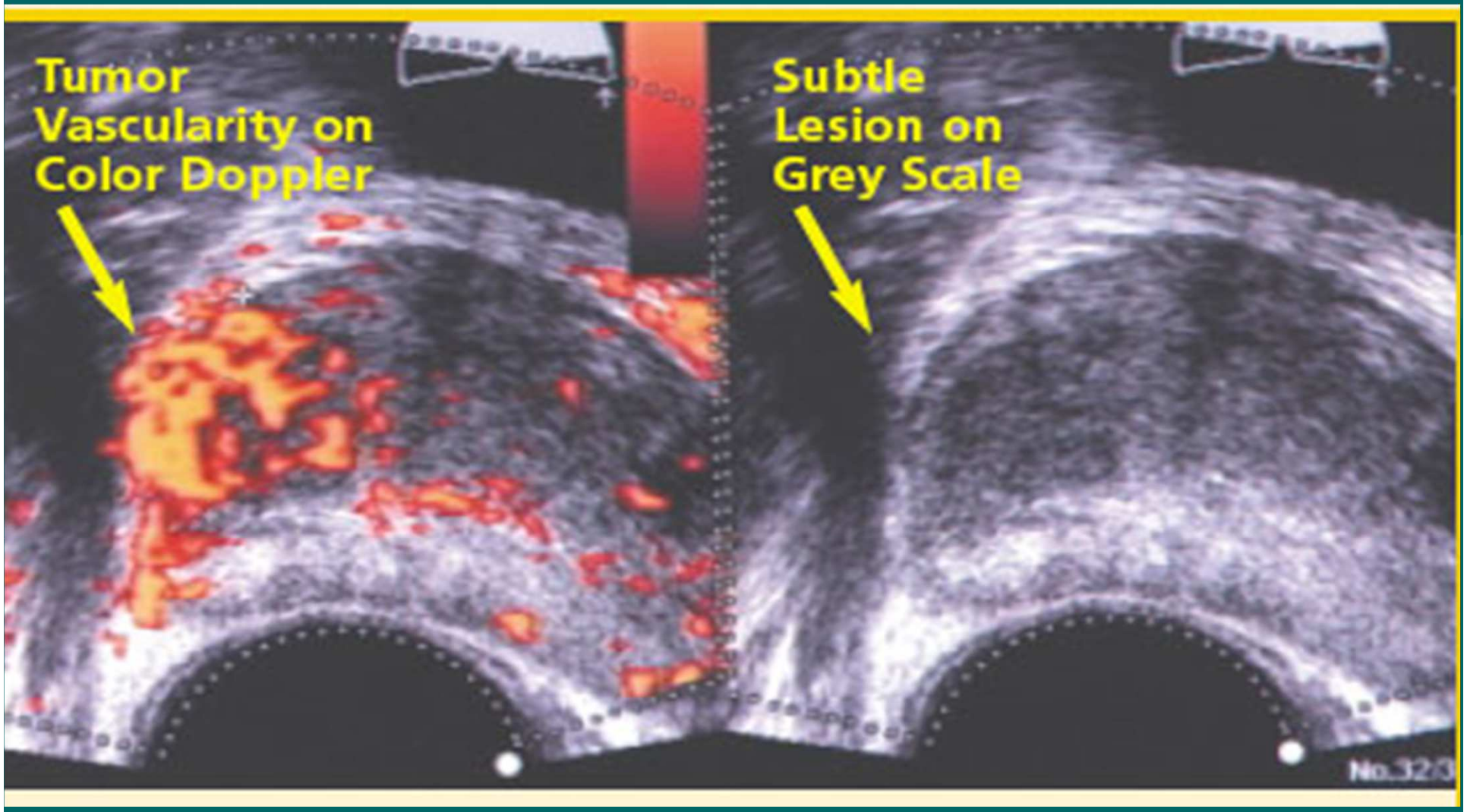

A
4
2
0
MI:1.6
2DG
80
DR
65
9C3
T8.0
18 fps
T

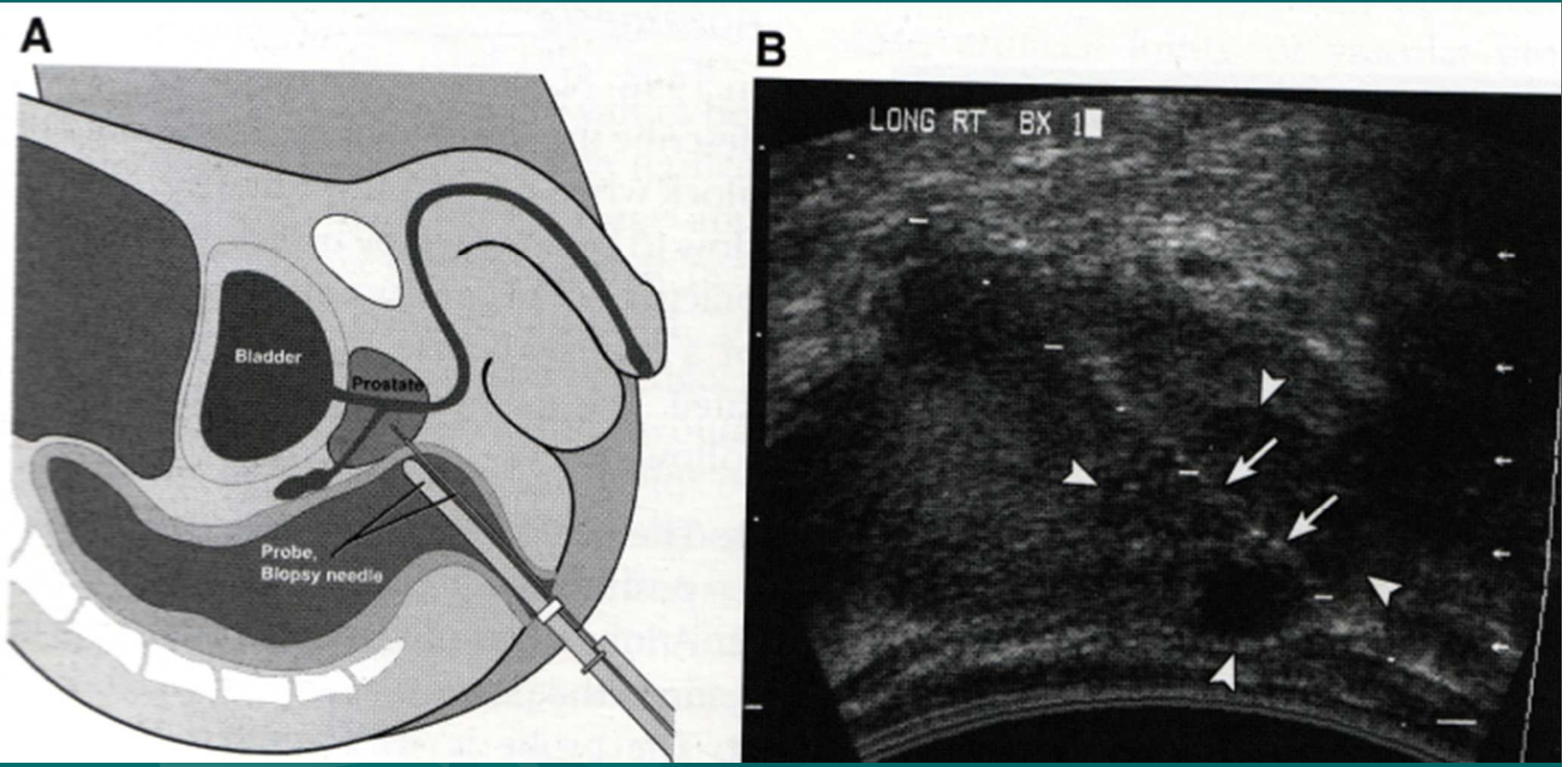

B
T

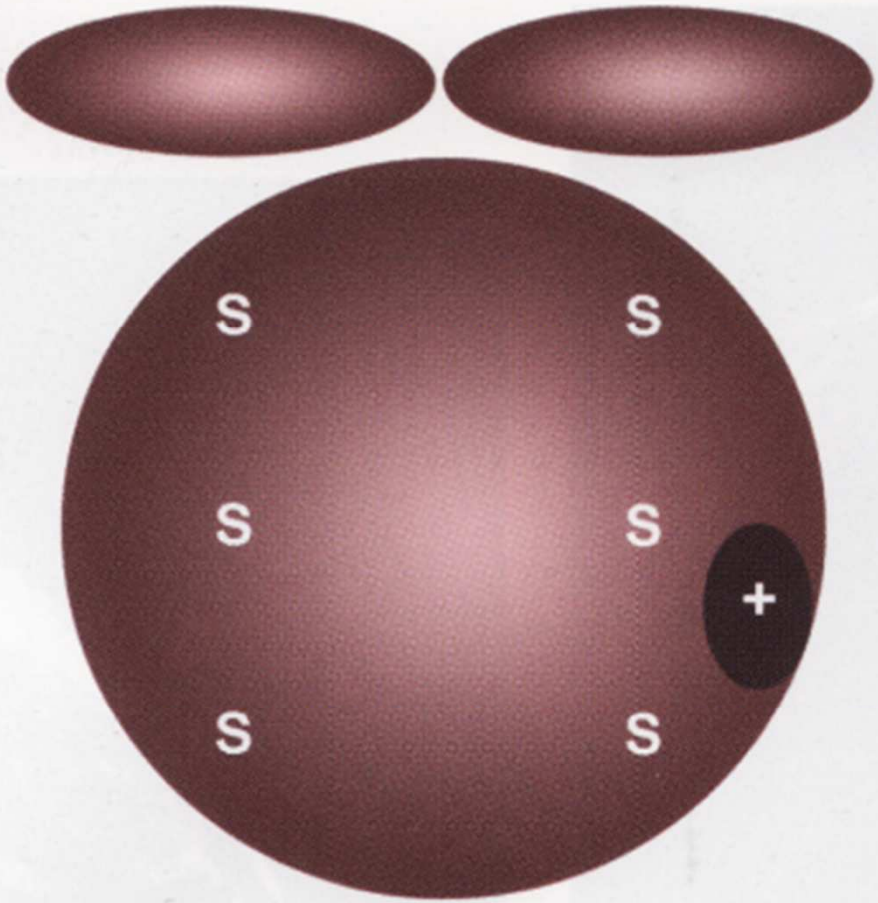

A
B
C
T
D
R
T

DOPPLER

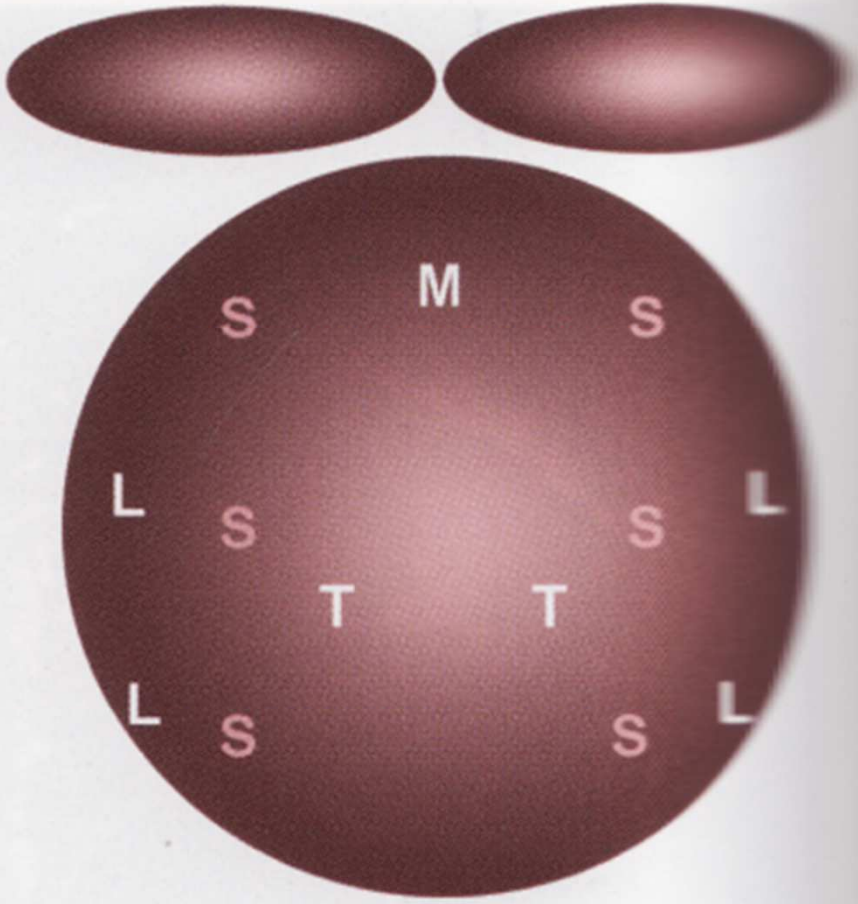
Doppler imaging has been evaluated for detection of neovascularity associated with cancers, especially isoechoic cancers.


Tumor
Vascularity on
Color Doppler
Subtle
Lesion on
Grey Scale

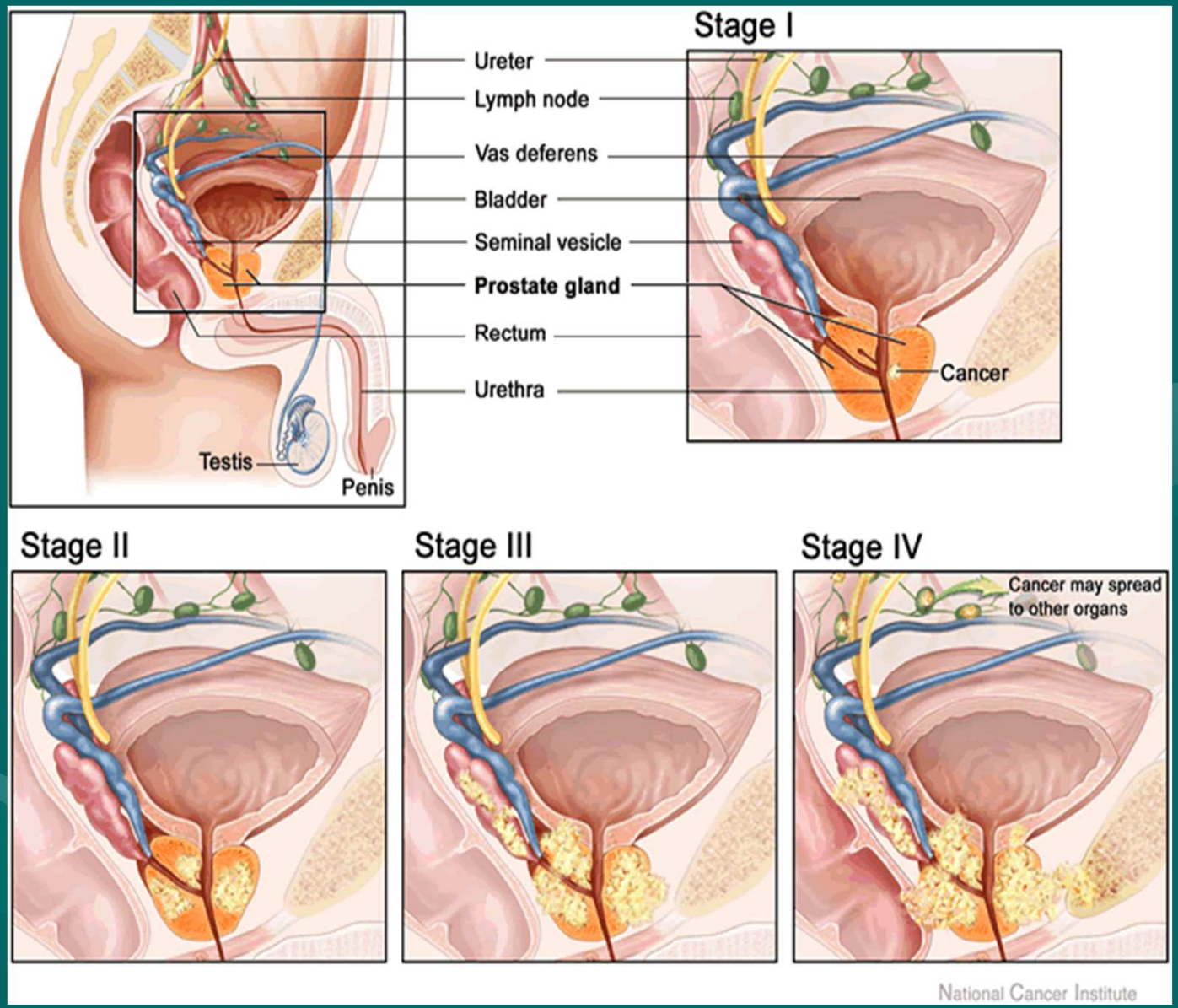

A
Bladder
Prostate
Probe,
Biopsy needle
B
LONG RT BX 1

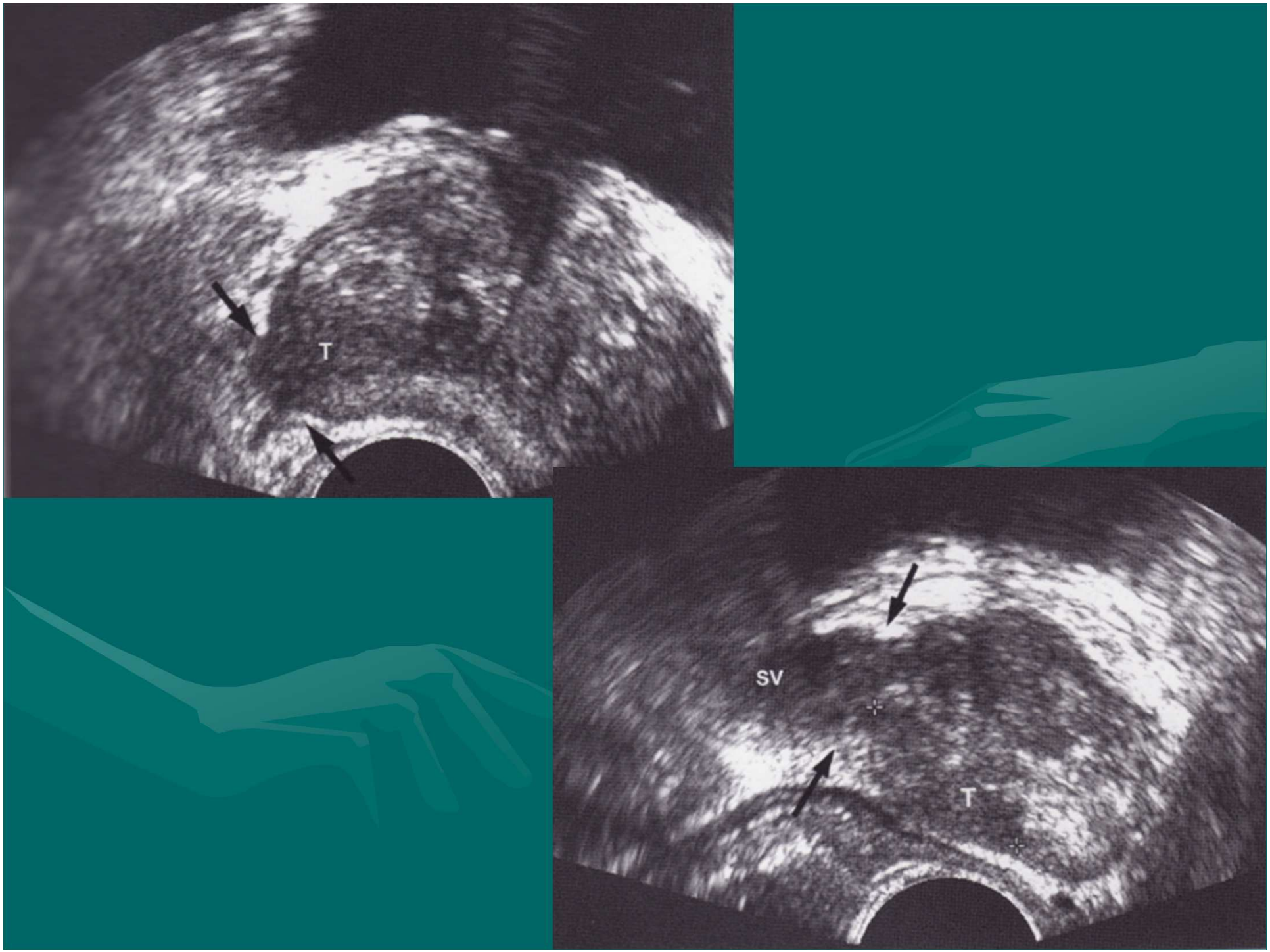


Sextant



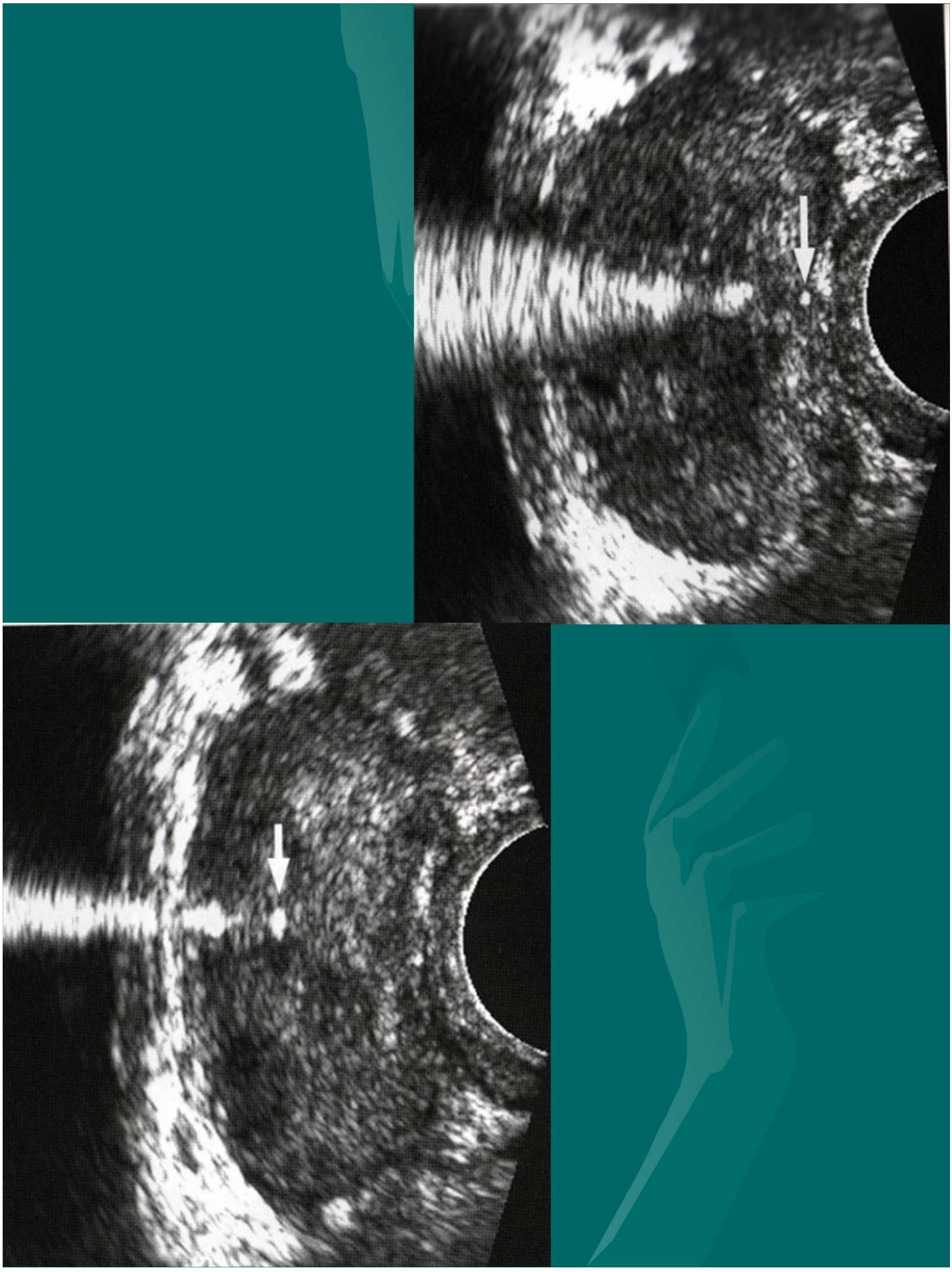
Extended

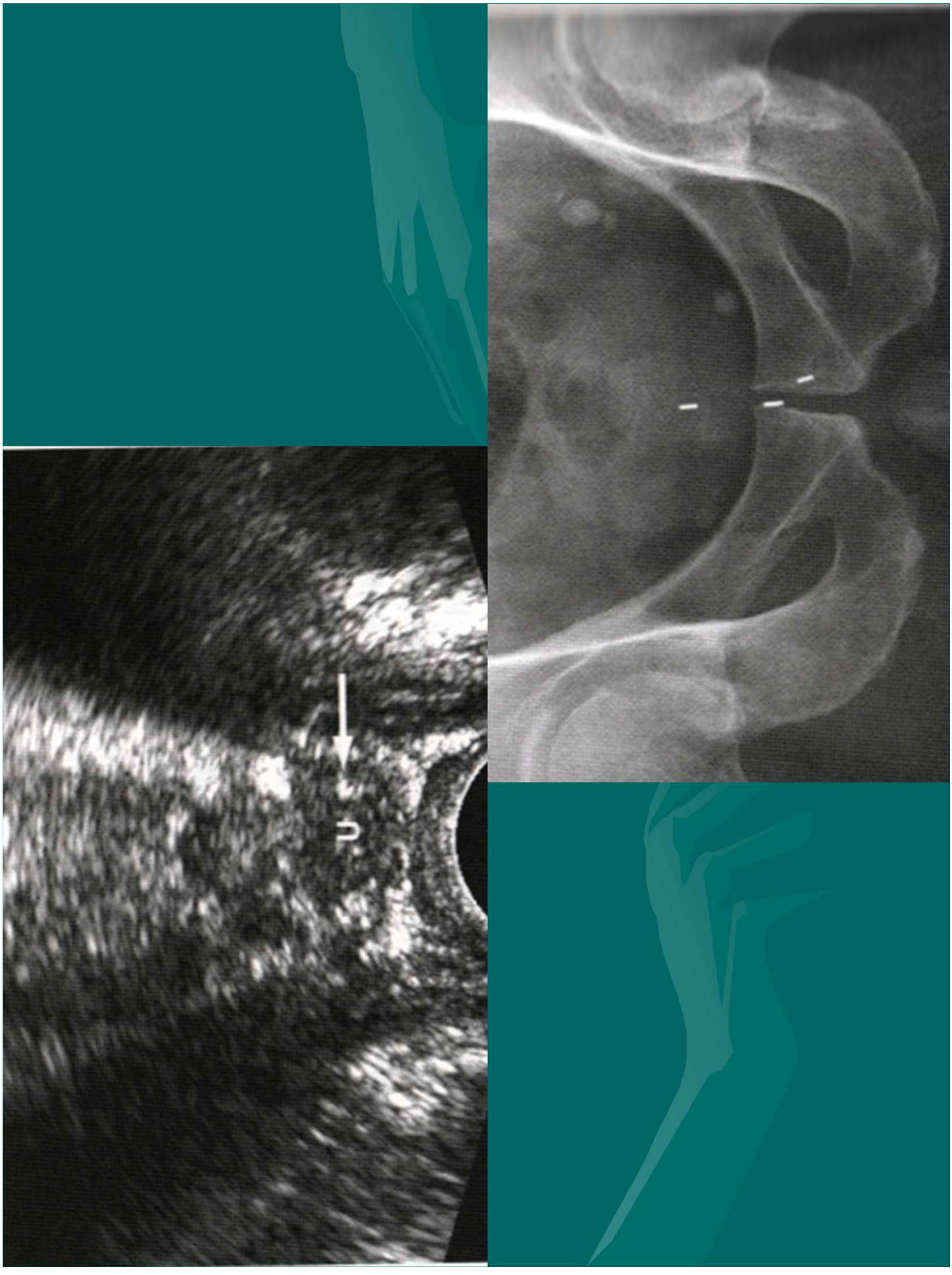

Stage I
Ureter
Lymph node
Vas deferens
Bladder
Seminal vesicle
Prostate gland
Rectum
Urethra
Testis
Penis
Cancer
Stage II
Stage III
Stage IV
Cancer may spread to other organs
National Cancer Institute


T
SV
T

THERAPY

EBRT
BRACHYTHERAPY
CRYOTHERAPY



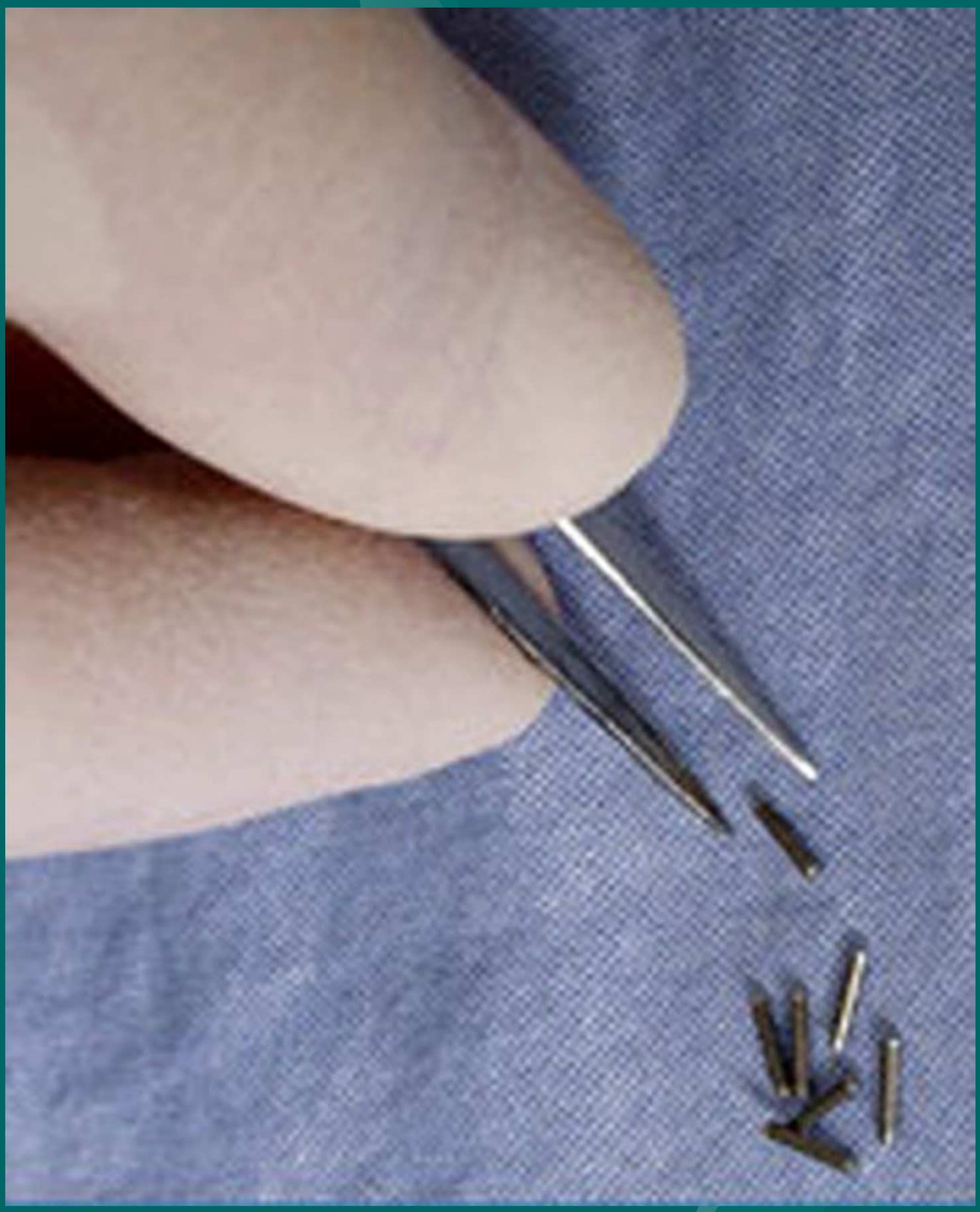


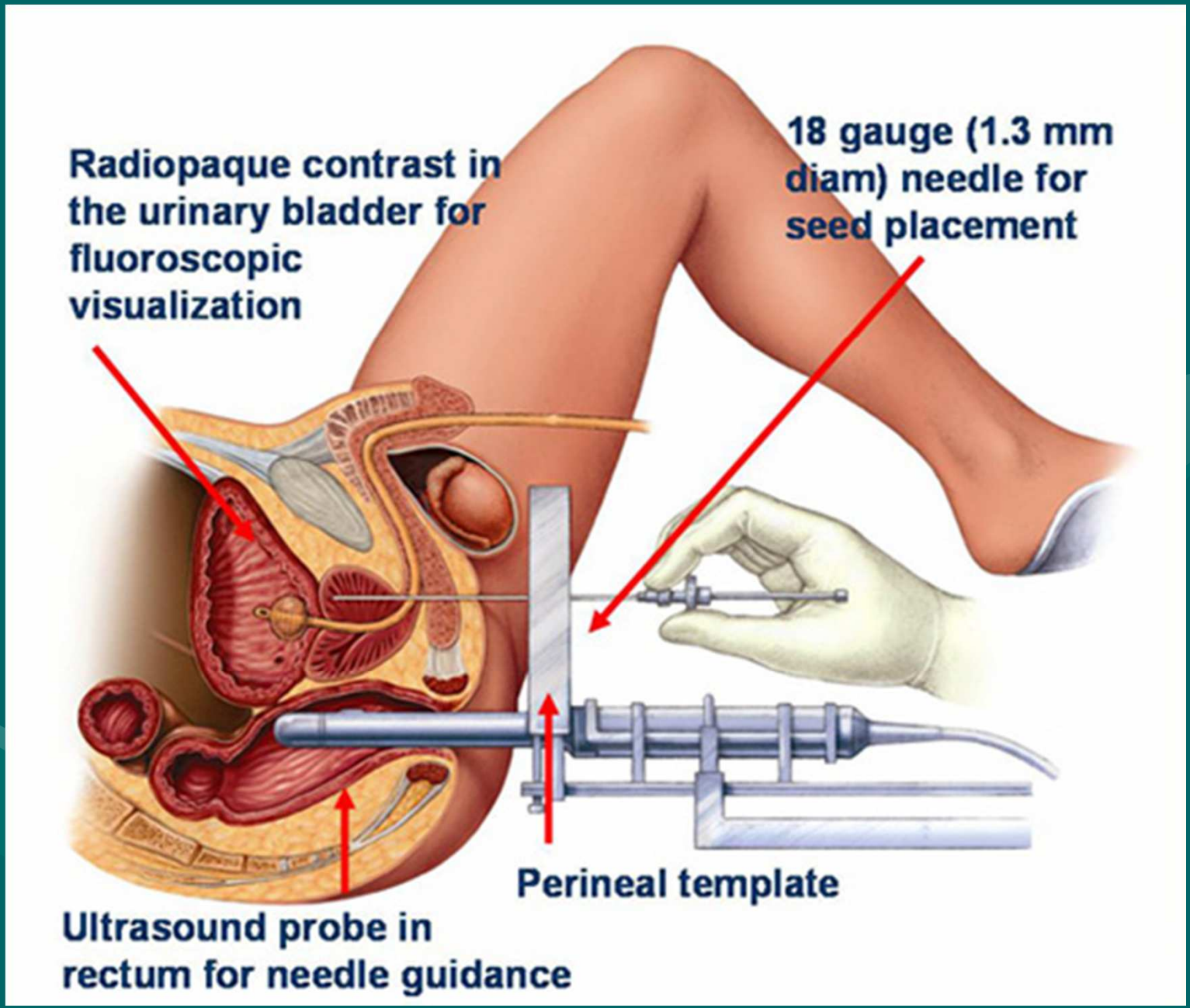
Attempting to improve the cure rate of a treatment will increase the side effect rate, unless there is increased targeting via the addition of resources, technology, or expertise.

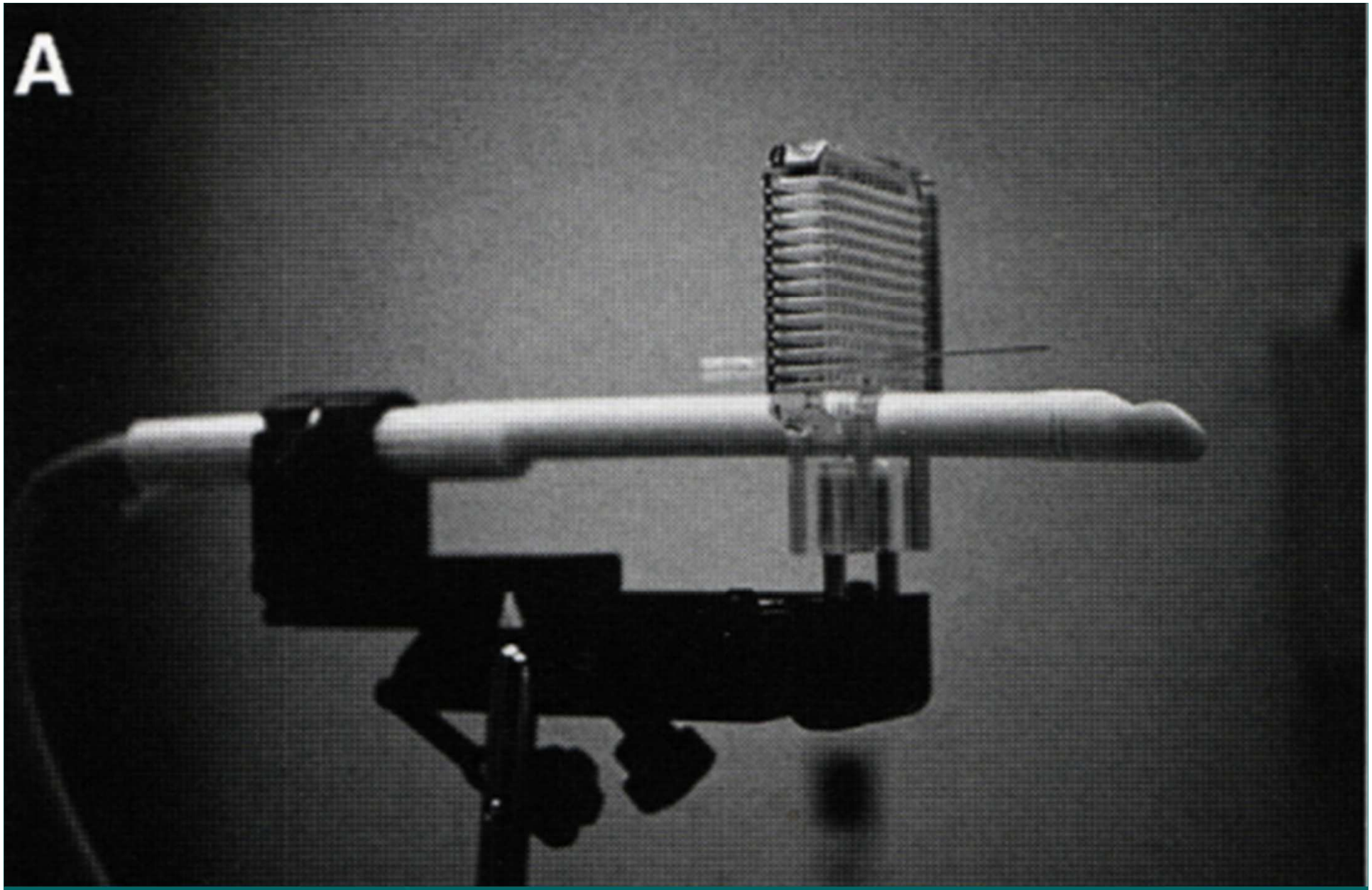
BRACHYTHERAPY

HDR (Temporary)
LDR (Permanent)


HDR
Catheters

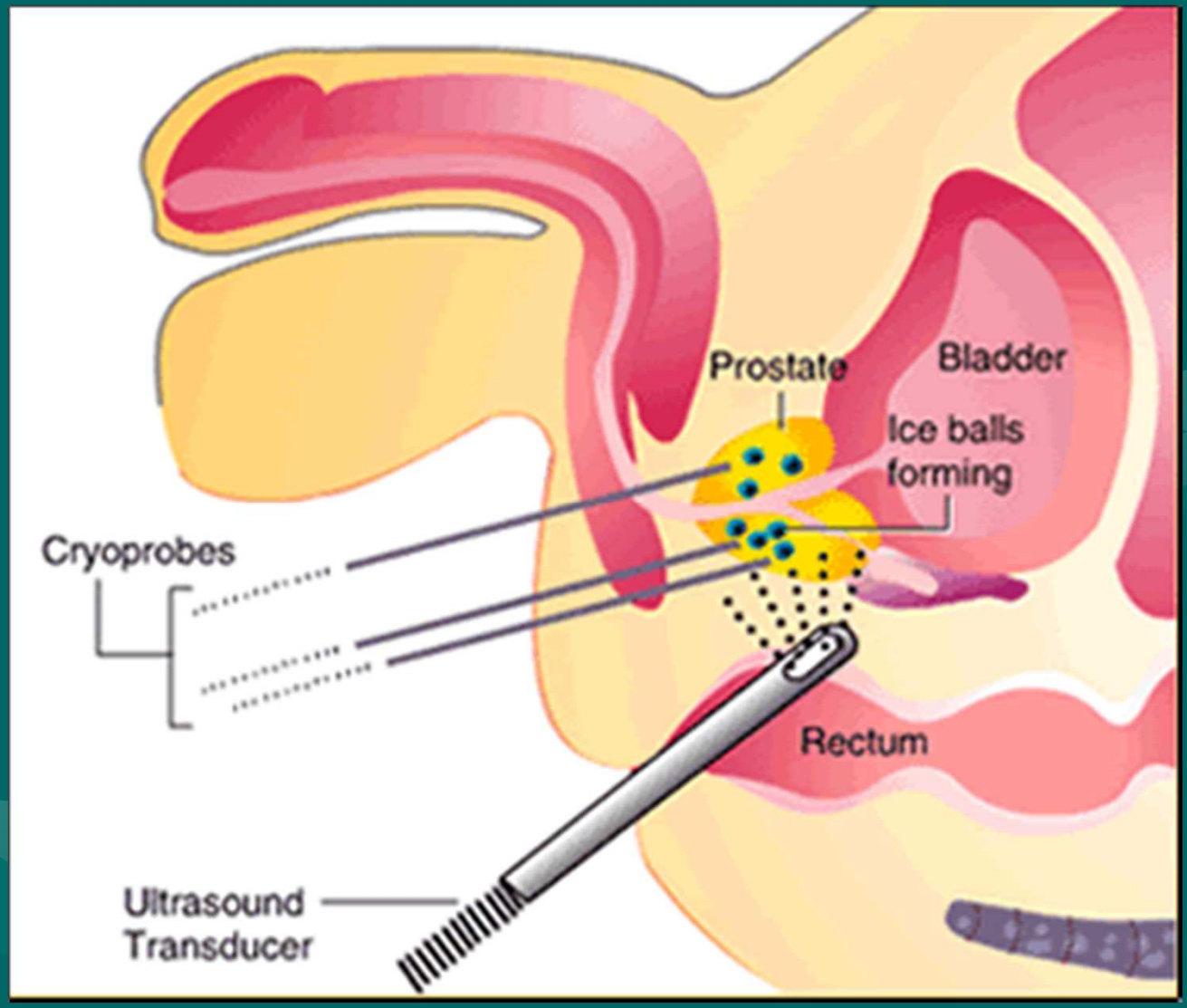



Radiopaque contrast in the urinary bladder for fluoroscopic visualization
18 gauge (1.3 mm diam) needle for seed placement
Perineal template
Ultrasound probe in rectum for needle guidance

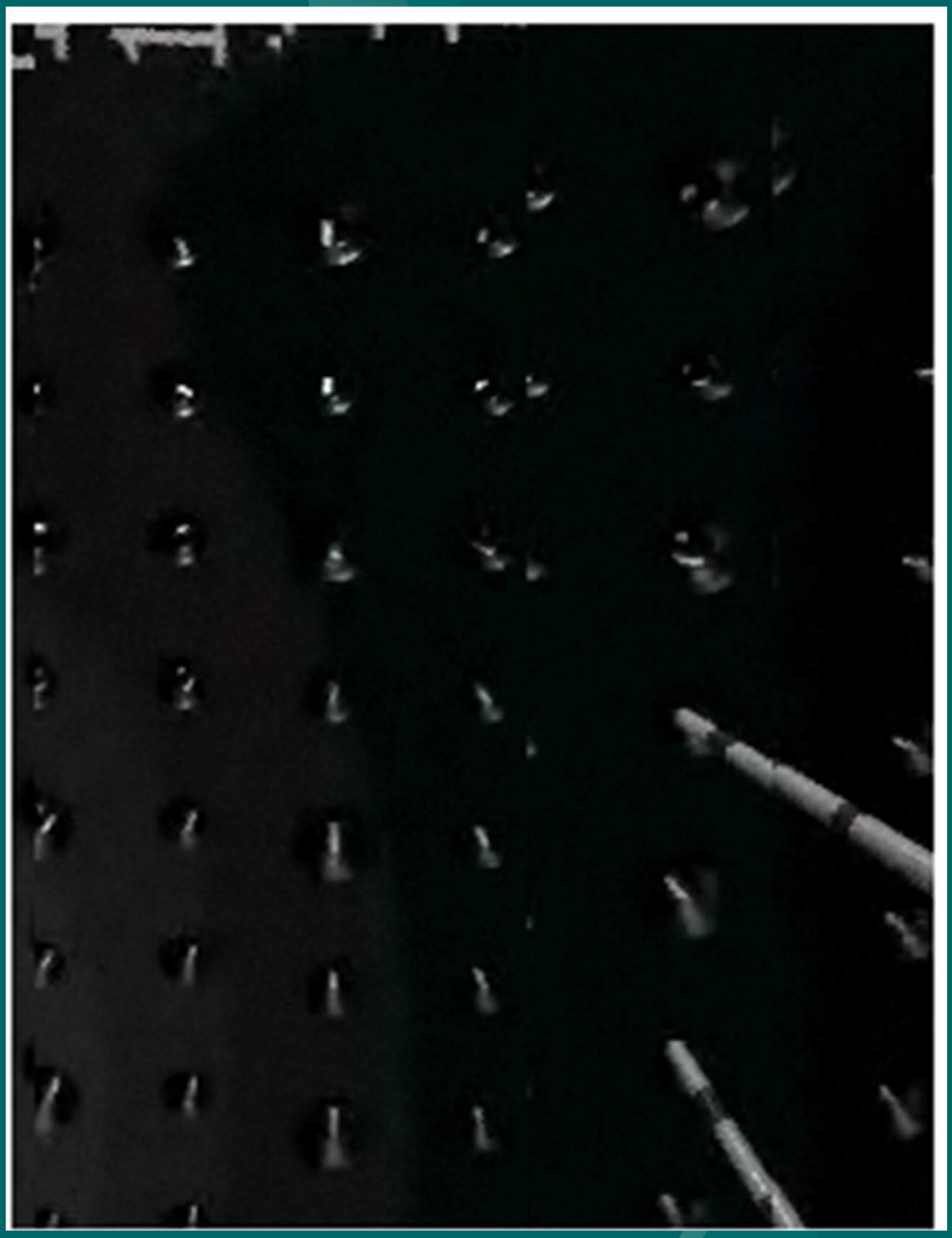

A

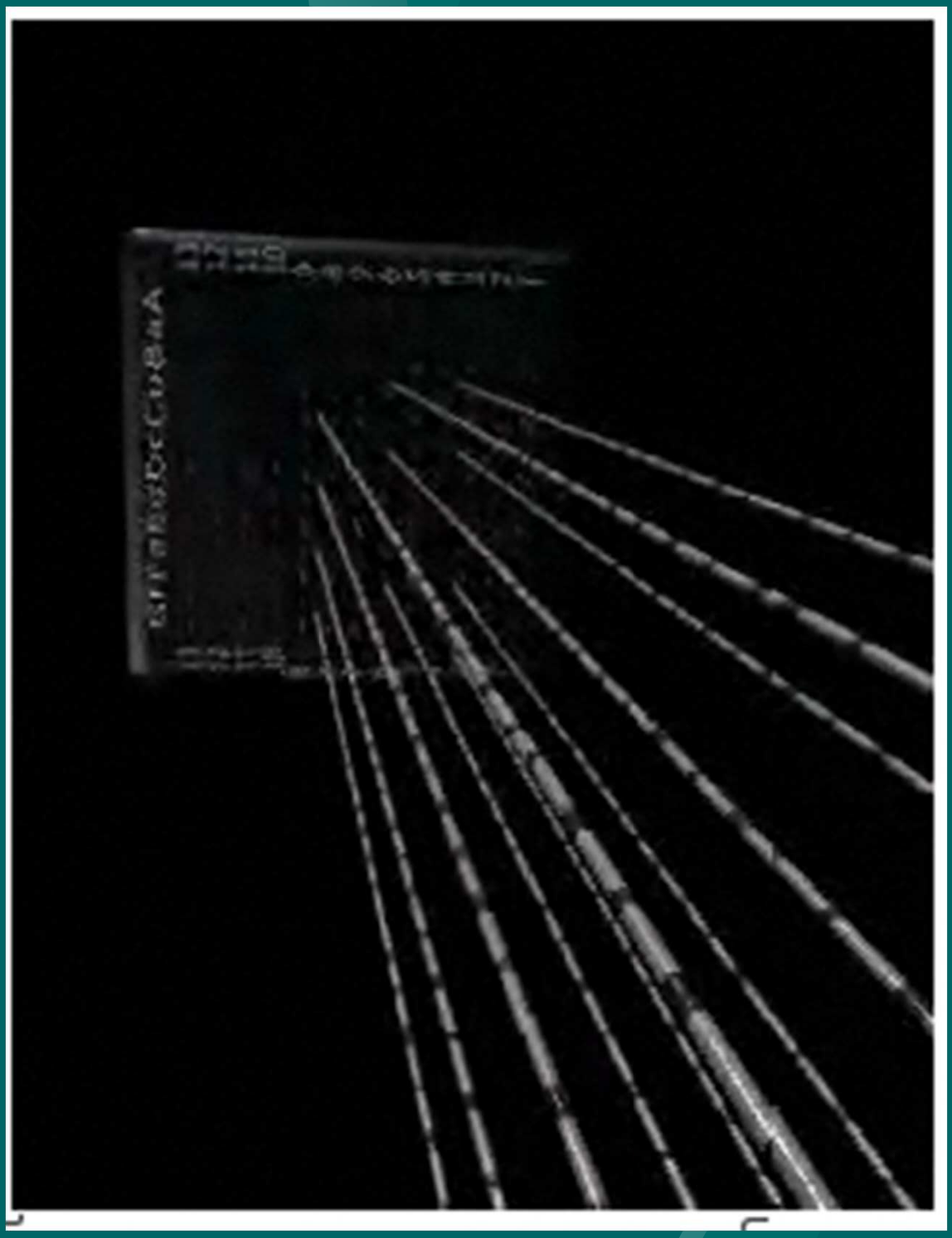

Permanent
Seeds

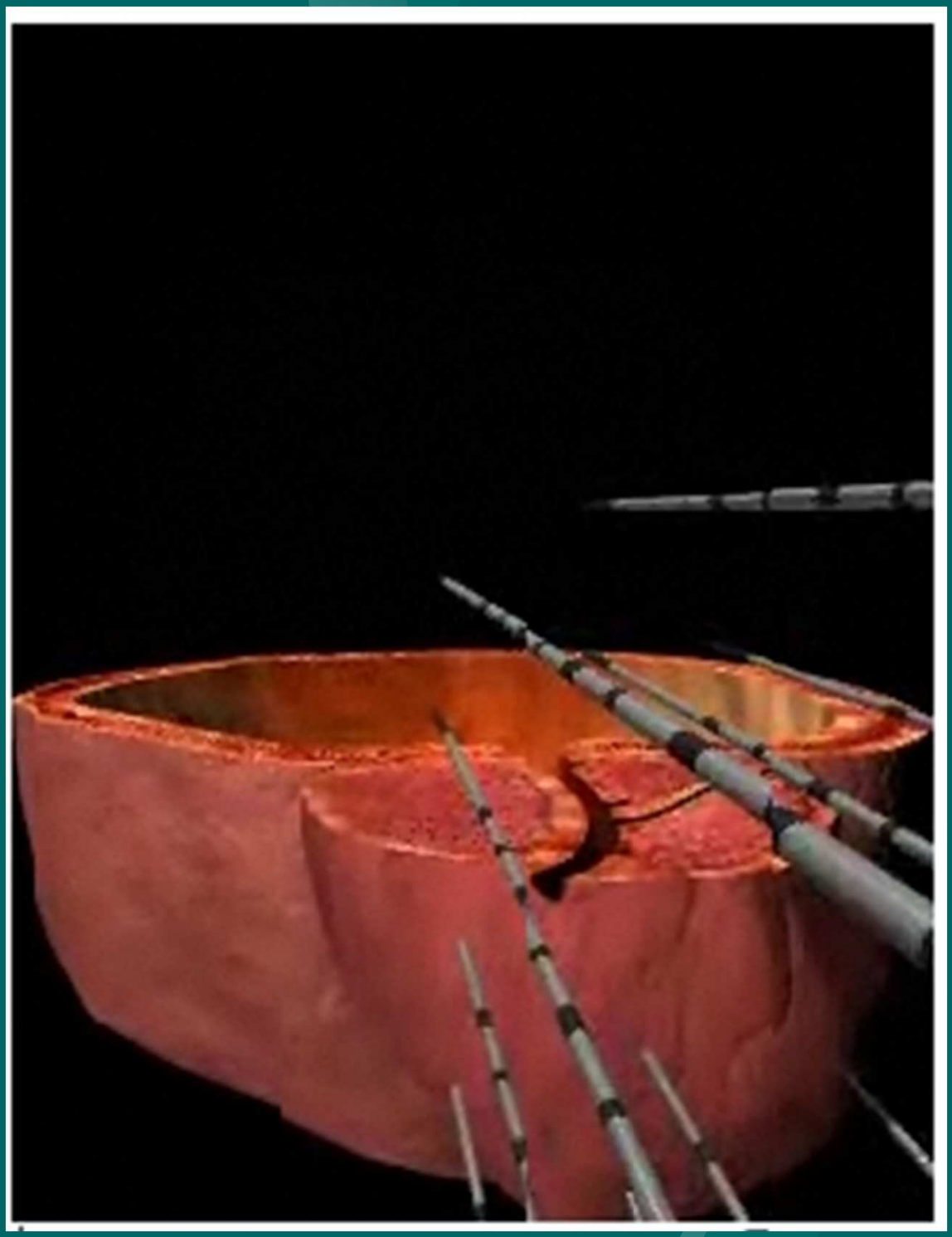
CRYOTHERAPY

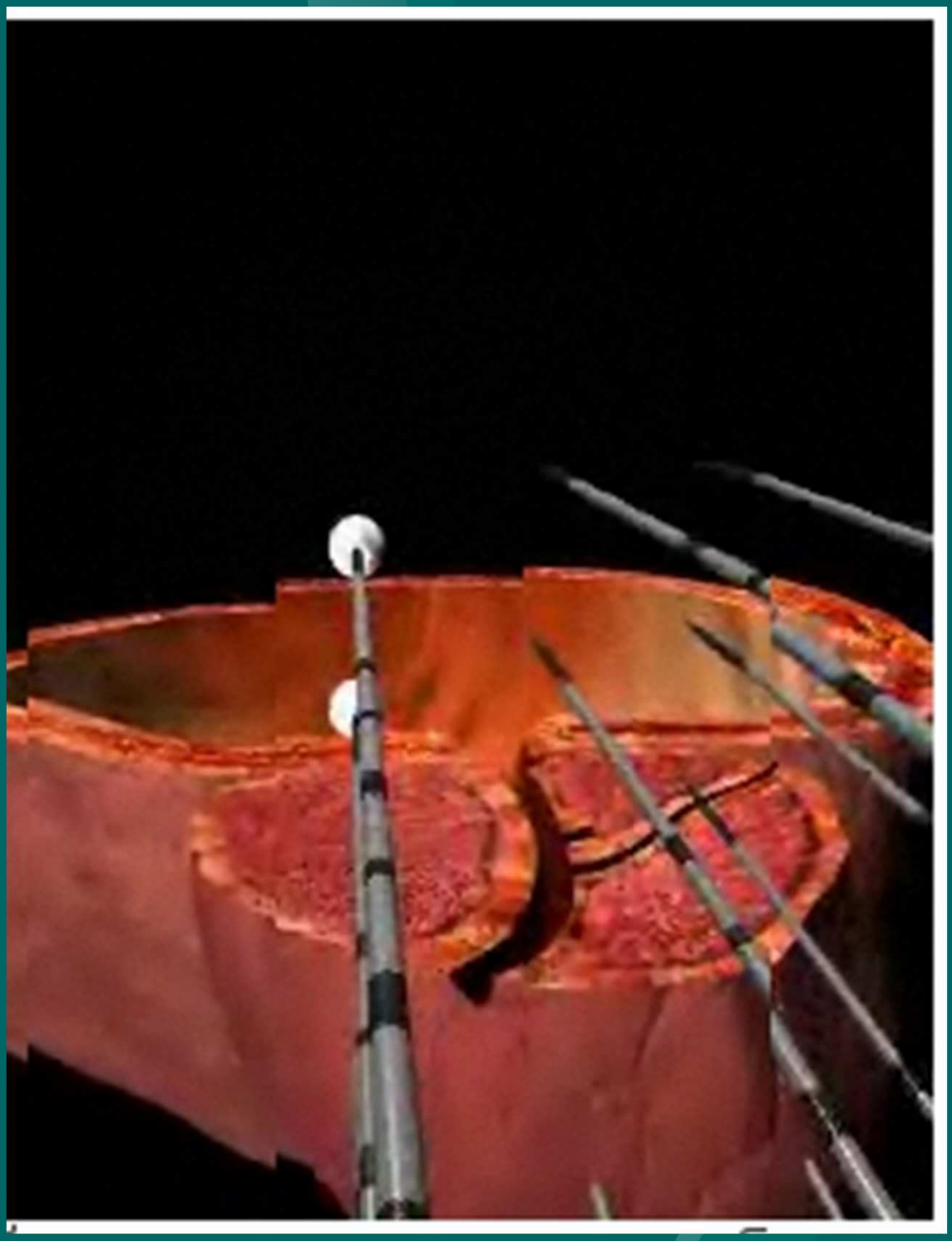

Prostate
Bladder
Ice balls forming
Cryoprobes
Rectum
Ultrasound Transducer

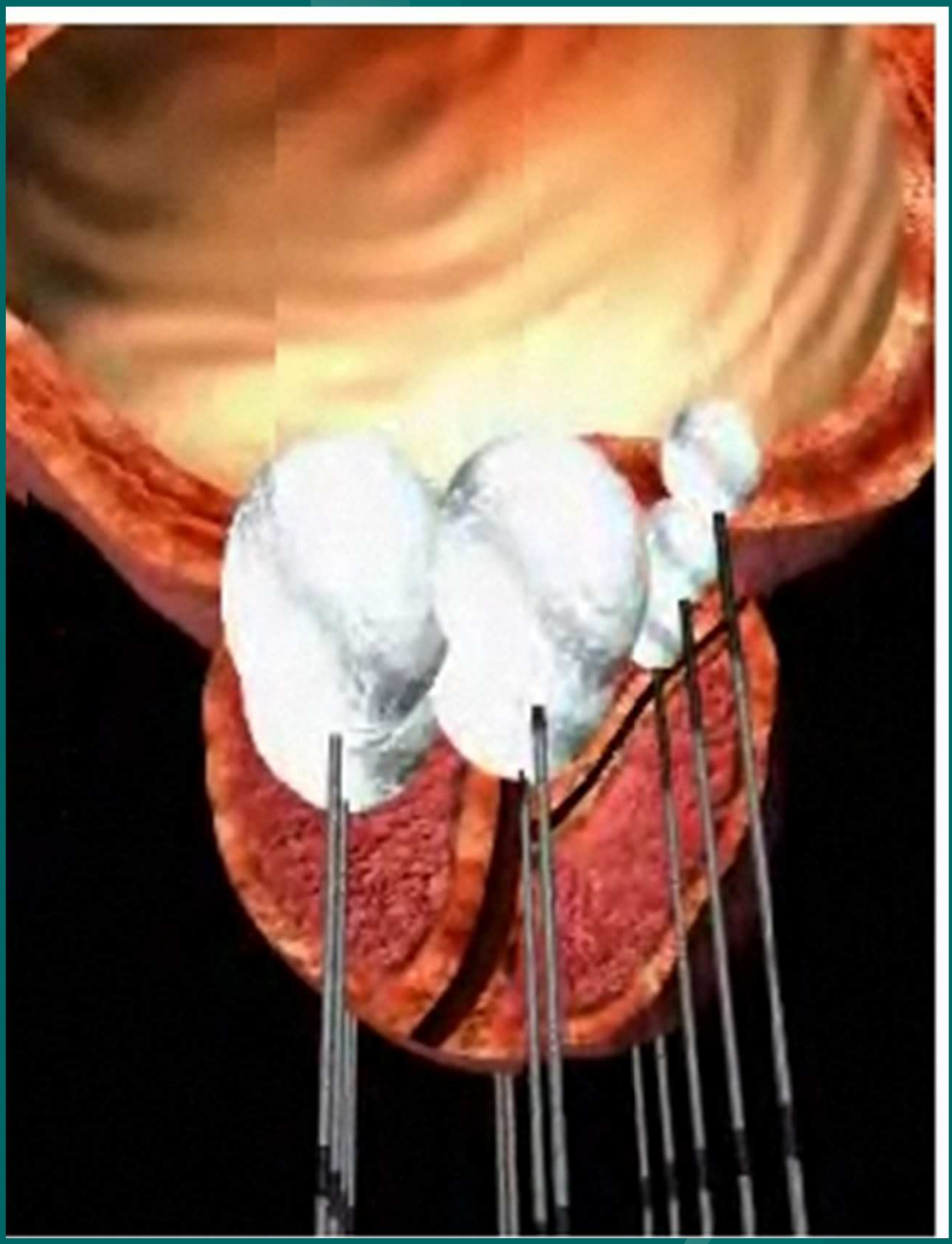

CRYOCARE CS

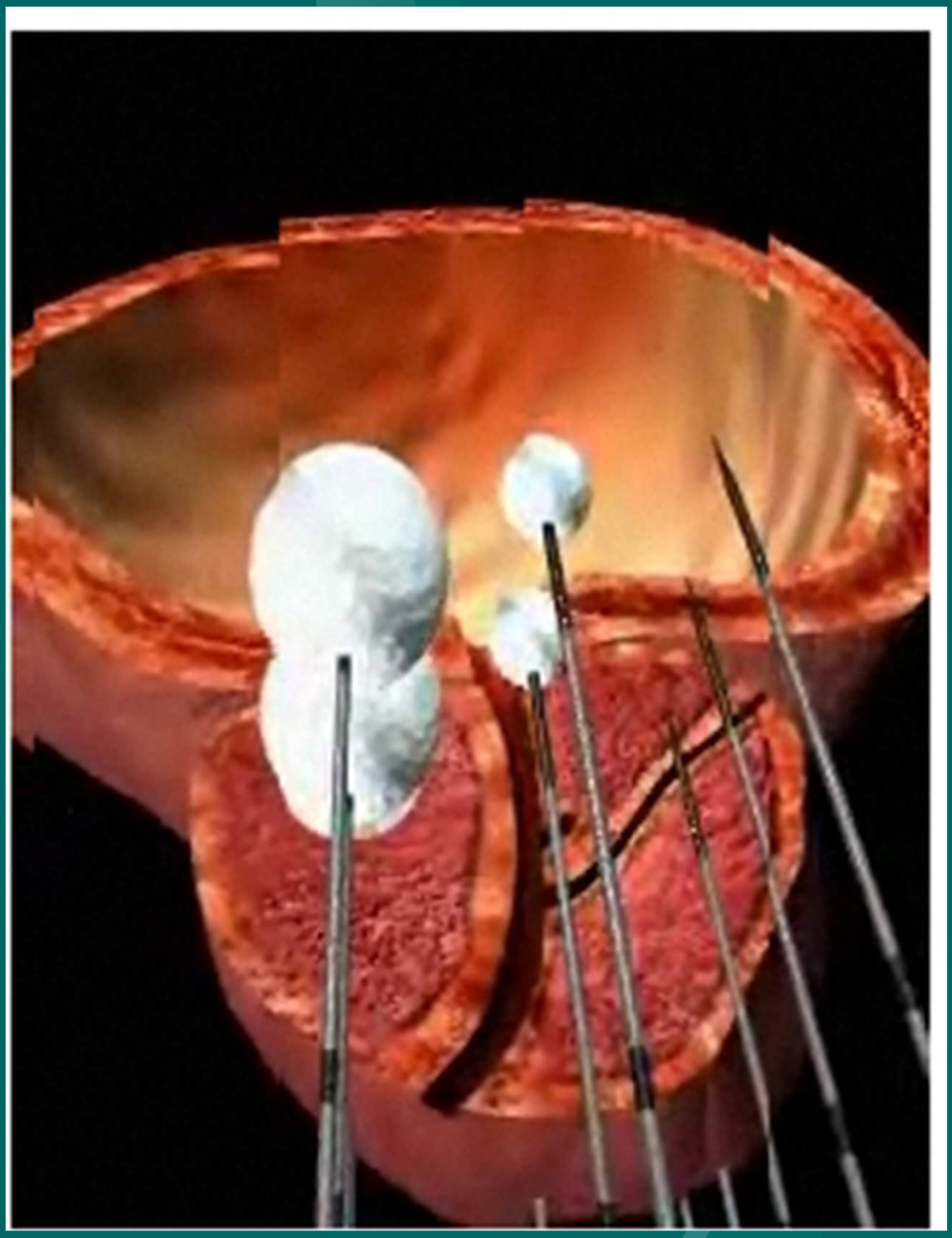


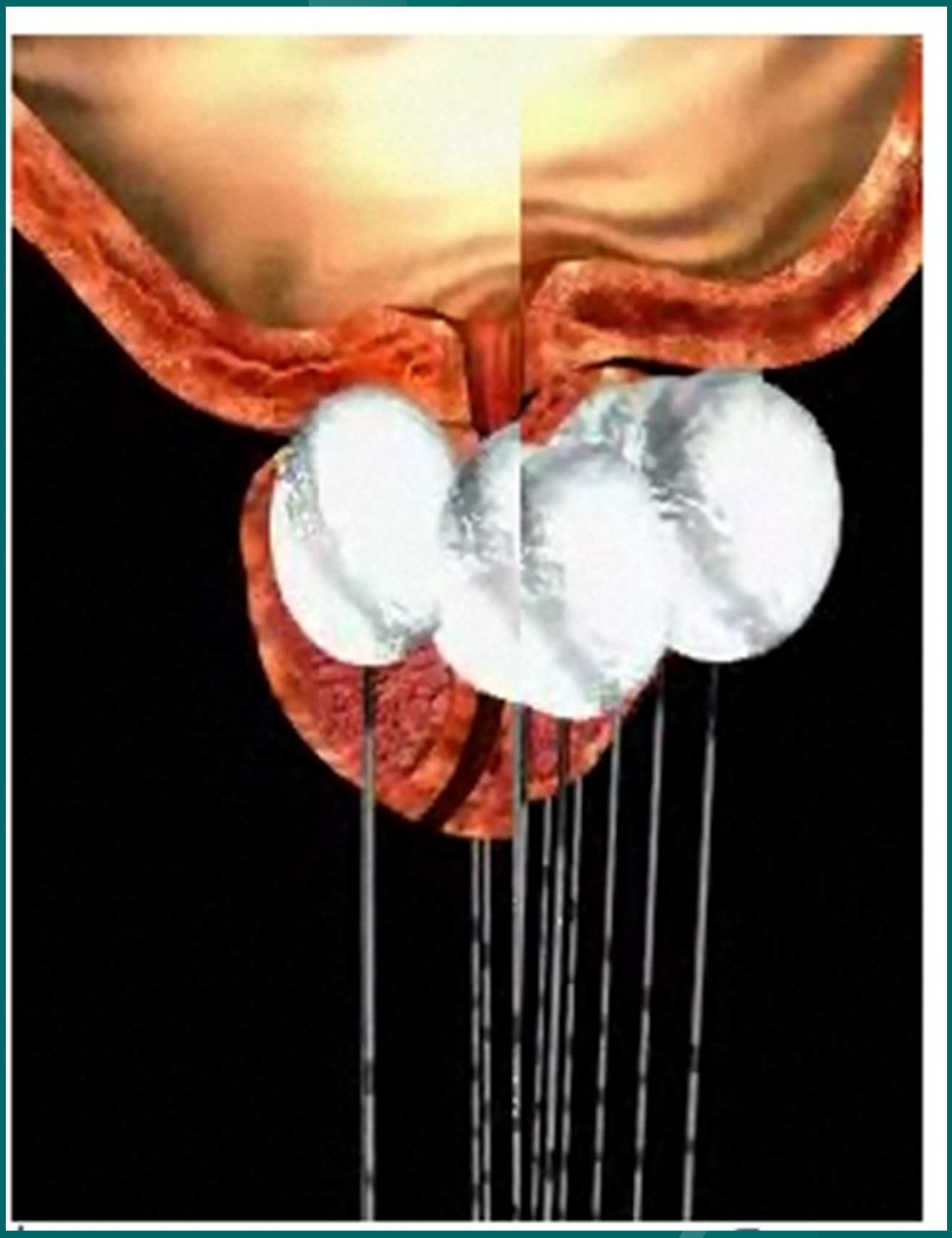












DISEASE-FREE SURVIVAL - CRYOTHERAPY

Author	Cases	Follow-up Years	Low Risk	Medium Risk	High Risk
Bahn[1]	590	7	92%	89%	89%
Donnelly[2]	76	5	60%	77%	48%

Side Effects for Cryotherapy

- Damage to the bowel is possible but very unusual occurring less than 1% of cases.
- Blood in the urine temporary and usually minor.
- Urinary urgency after catheter removal (temporary).
- Scrotal swelling – not painful but may take 2-4 weeks to settle.

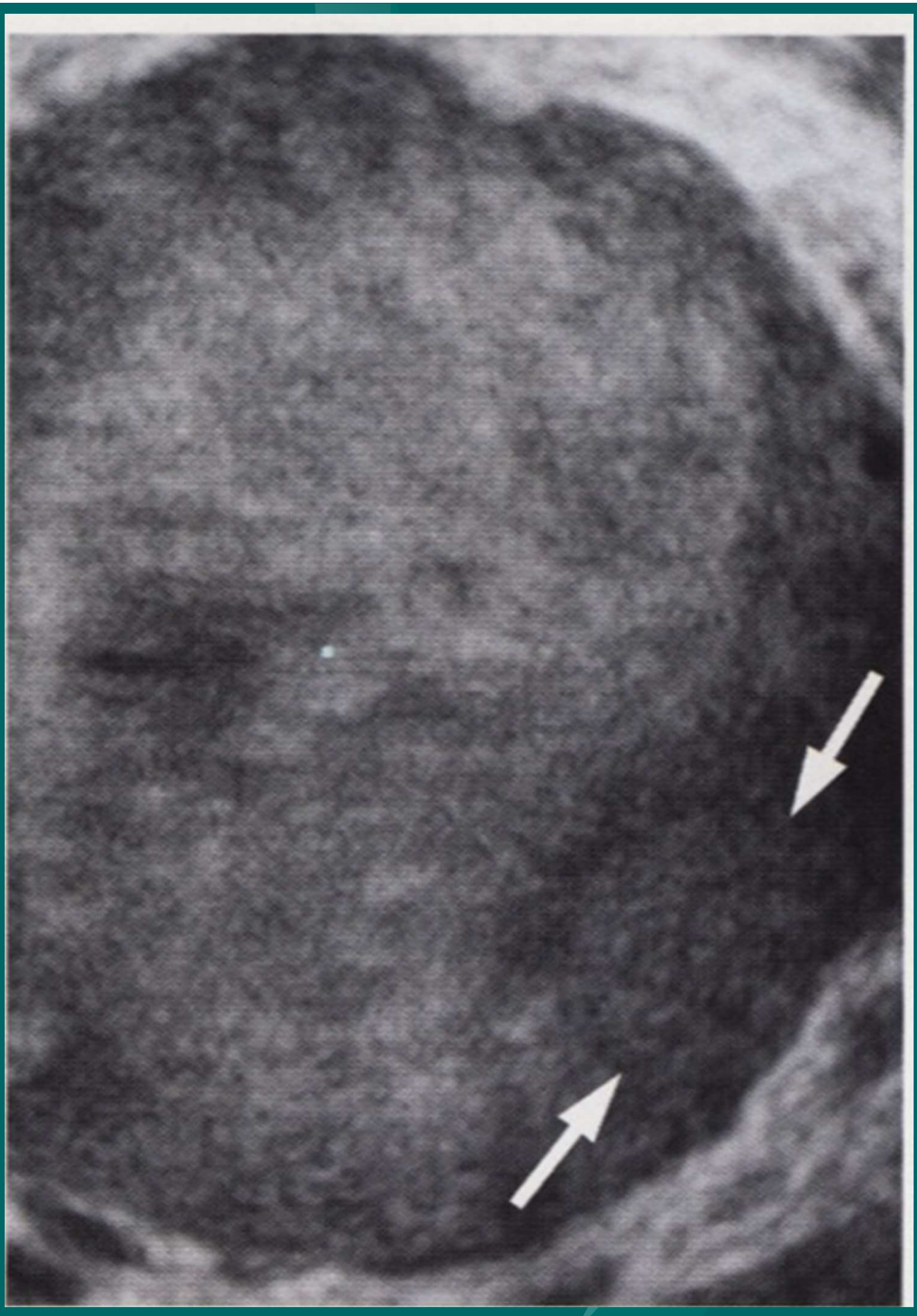
CRYOTHERAPY COMPARED WITH RADIATION THERAPY

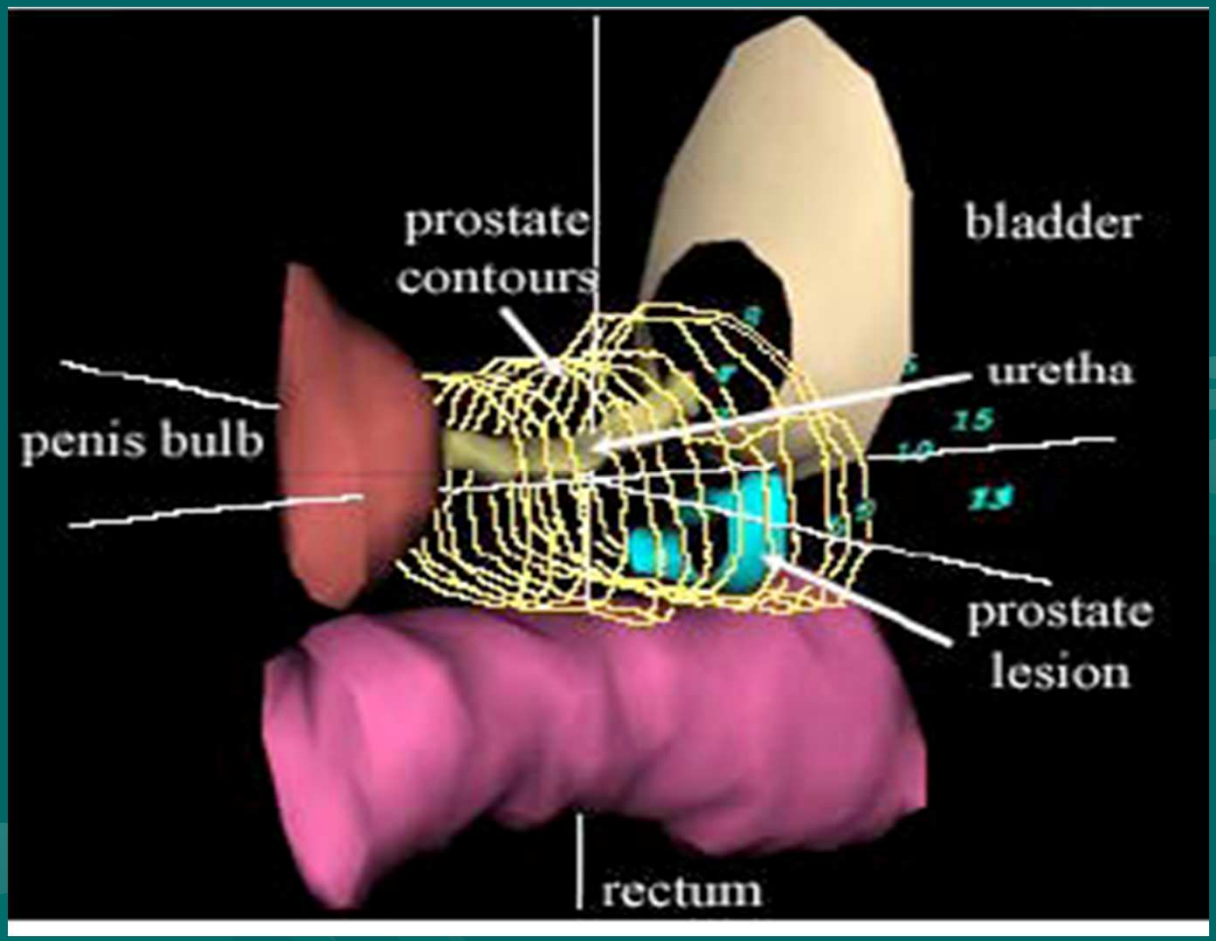
	Cryotherapy	External Beam Radiation Therapy (EBRT)	Brachytherapy
Treatment Description	1½ hour minimally invasive (needles inserted) procedure in which the prostate is frozen but not removed.	7-8 week treatment where radiation is aimed at the prostate but also passes through healthy tissue.	Permanent implantation of 80-100 radioactive pellets into the prostate.
Recovery	Single Day Surgery procedure. Resume normal lifestyle in 2-3 days.	5 treatments per week for 7-8 weeks at Radiation Centre. Up to six weeks of tiredness (longer if hormone therapy also used).	Overnight stay procedure. Up to 3 months of residual pain and bowel symptoms.
Incontinence	0% - 3%	0% - 12%	0% - 17%
Impotence	20% - 80%	5% - 85%	0% - 65%
Rectal Injury	1%	12% - 15%	5% - 20%

RECENT ADVANCES

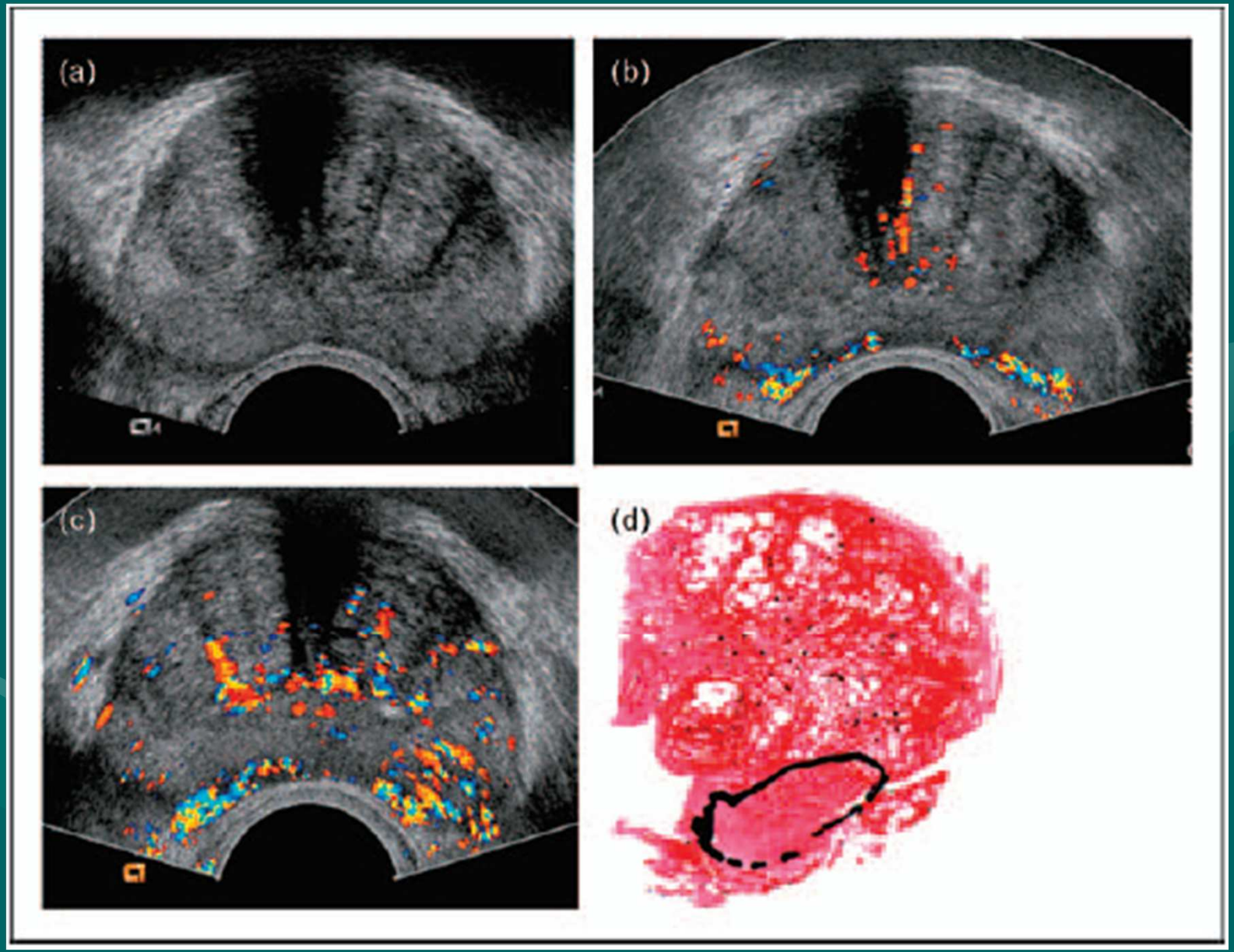
3 D TRUS
Contrast enhanced TRUS
HIFU
Sonoelastography
PET/Ultrasound Imaging

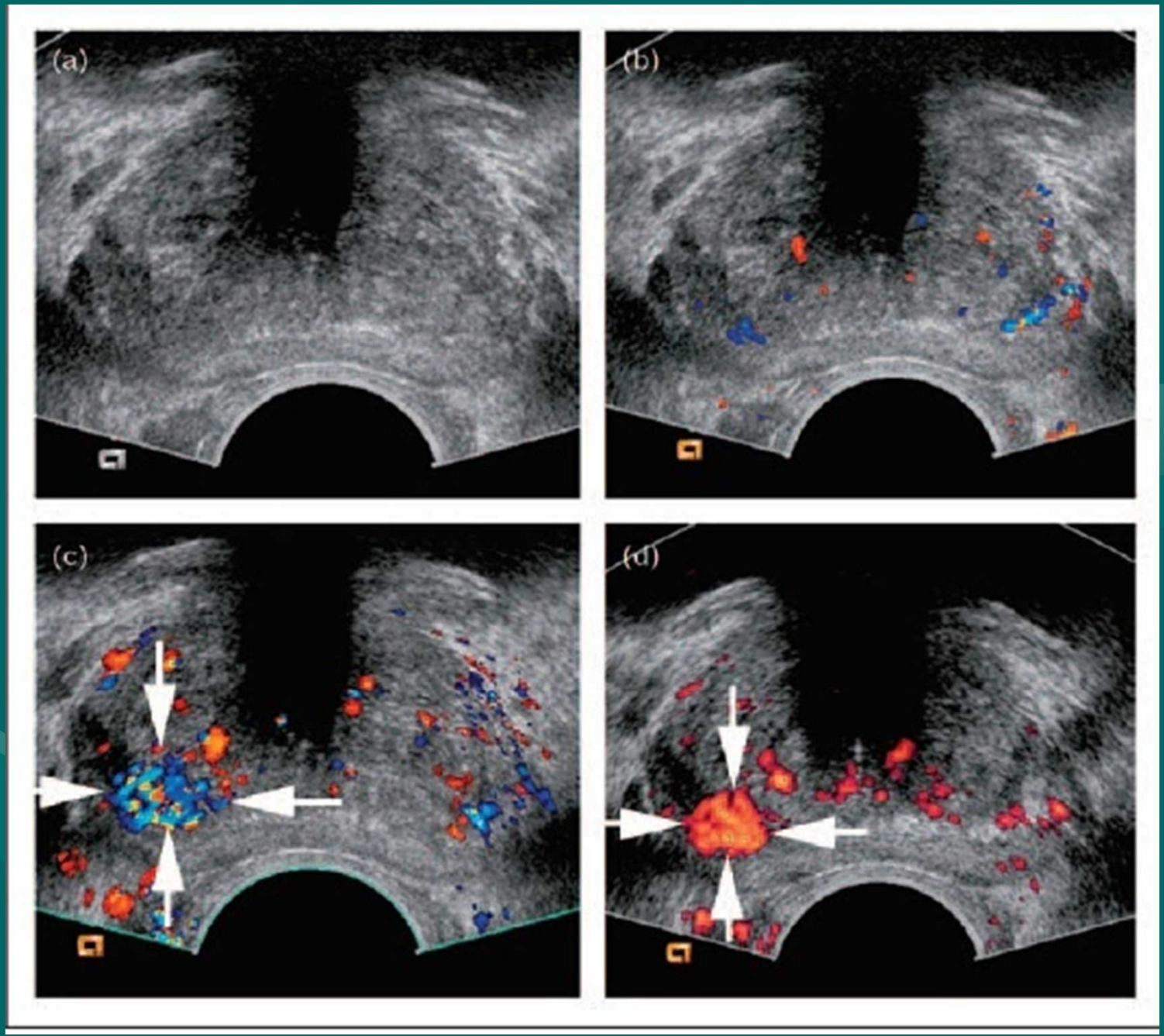
3D TRUS




prostate
contours
bladder
uretha
penis bulb
prostate
lesion
rectum

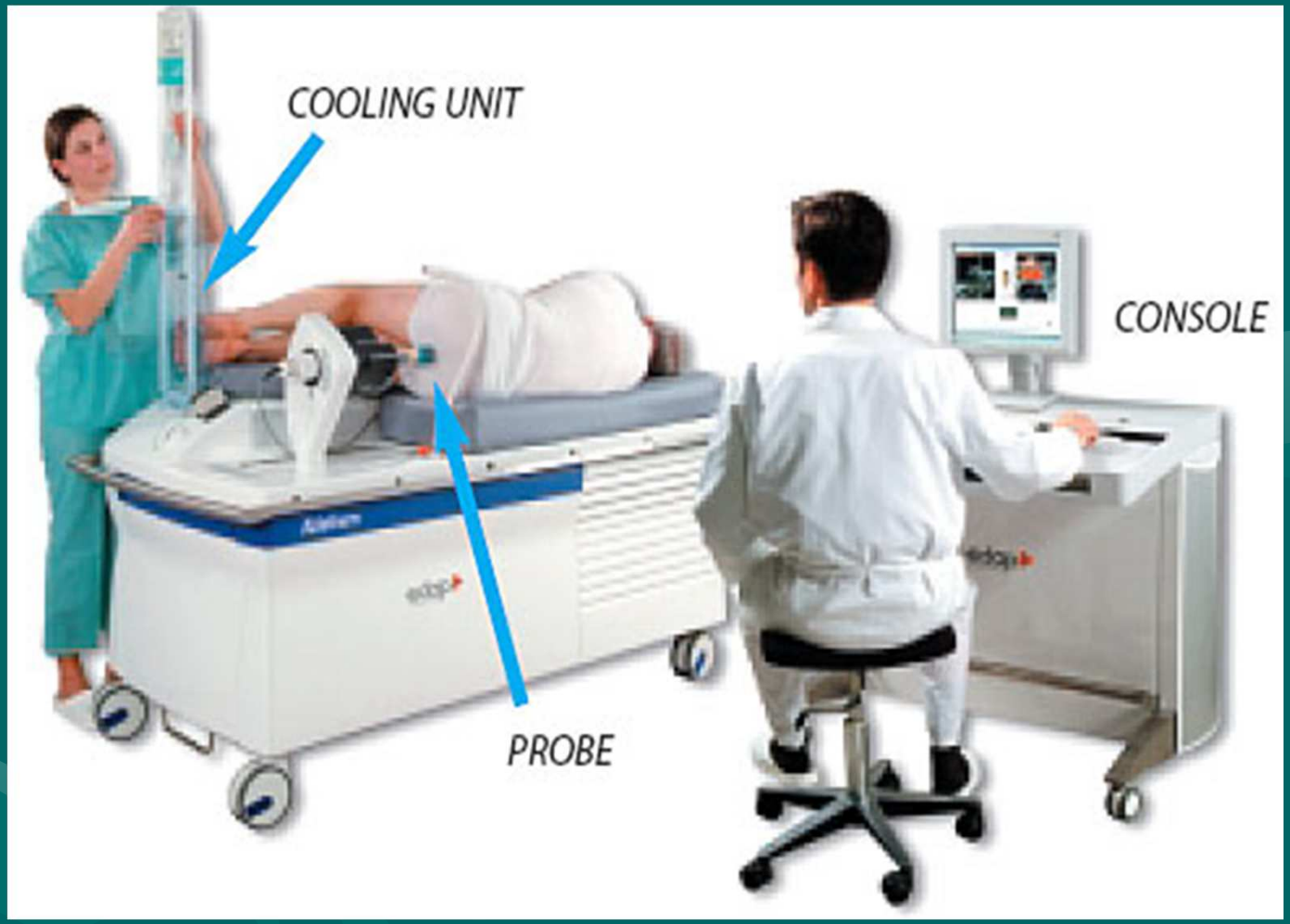
Contrast enhanced TRUS

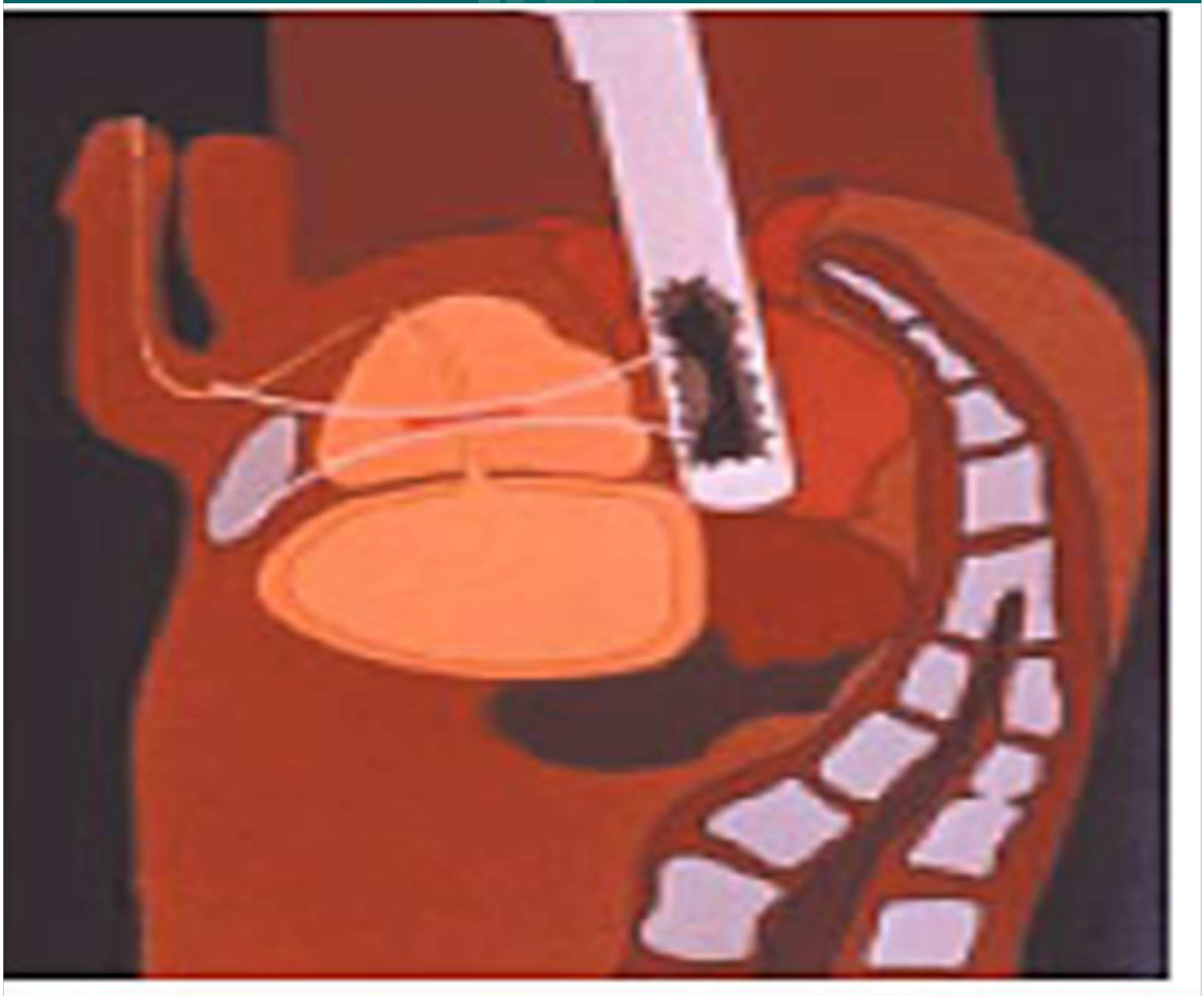

(a)
(b)
(c)
(d)

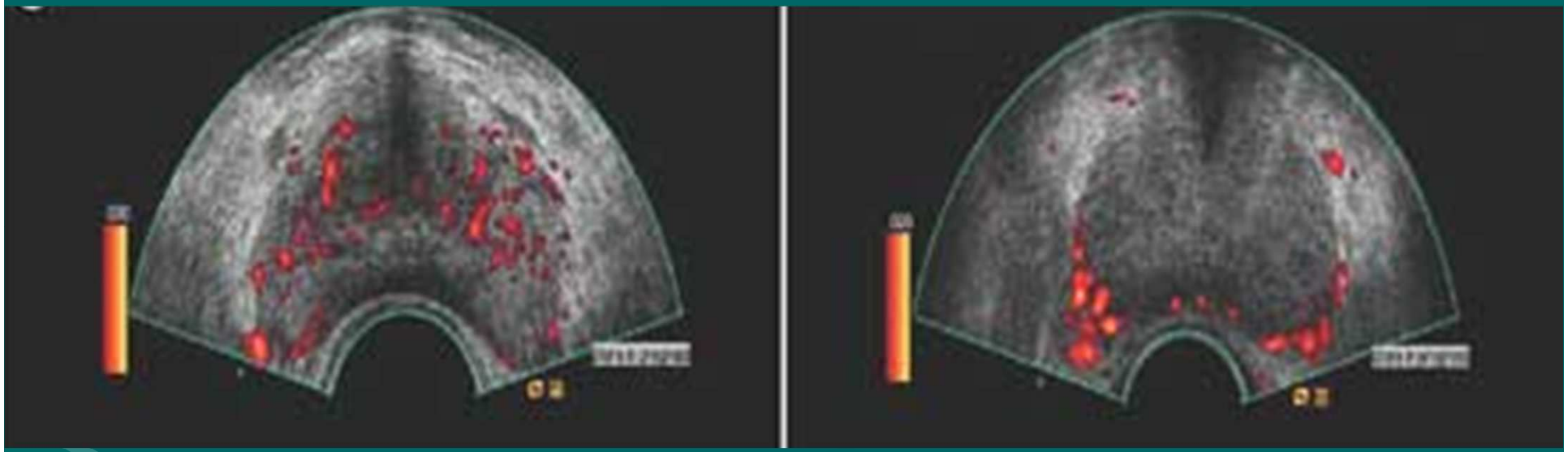

(a)
(b)
(c)
(d)

HIFU

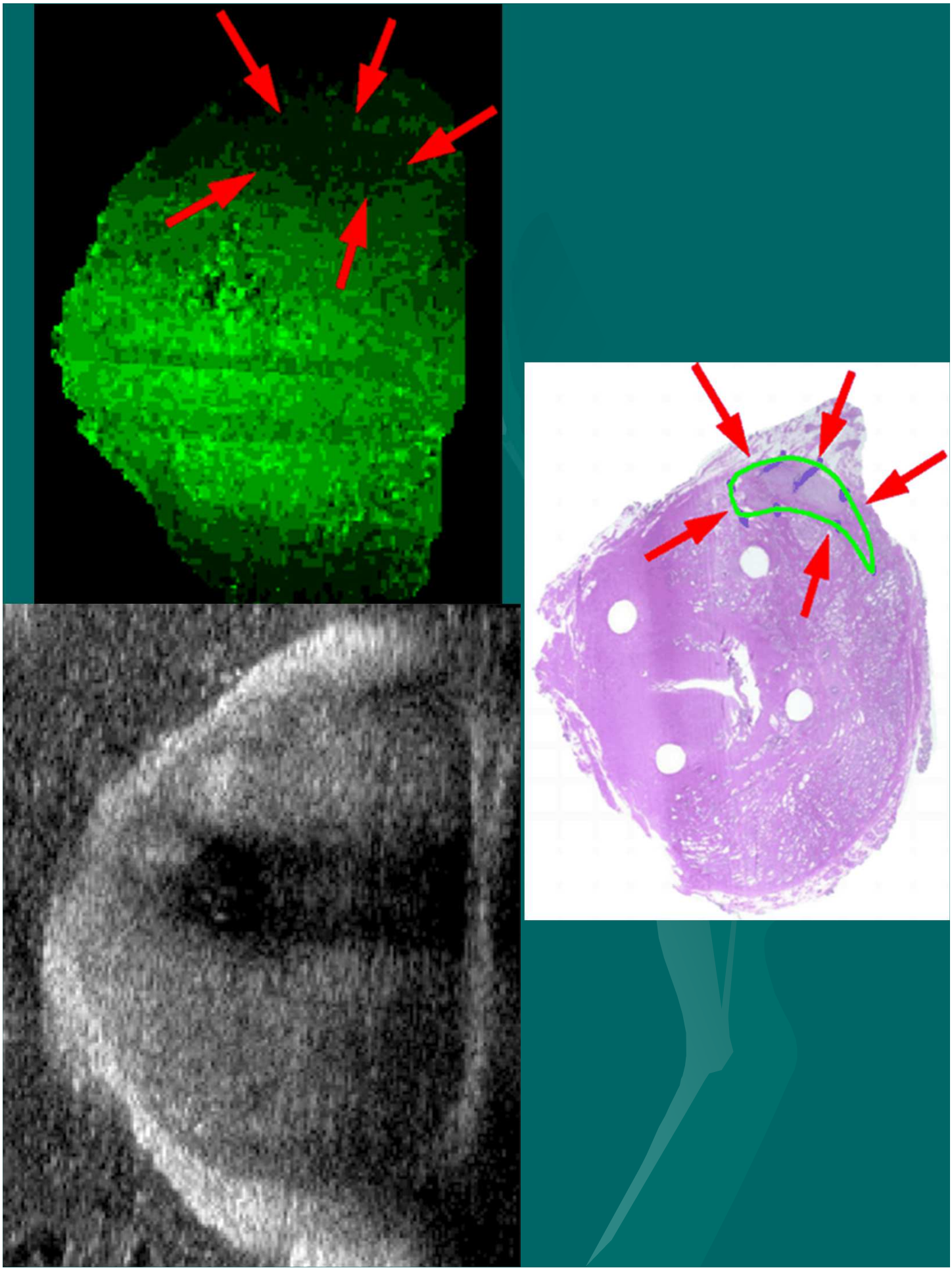
This procedure utilizes transrectal ultrasound that is highly focused into a small area, creating intense heat of 80-100° C, which is lethal to prostate cancer tissue. Since ultrasound is non-ionizing (as opposed to ionizing in radiation), tissue in the entry and exit path of the HIFU beam is not injured.

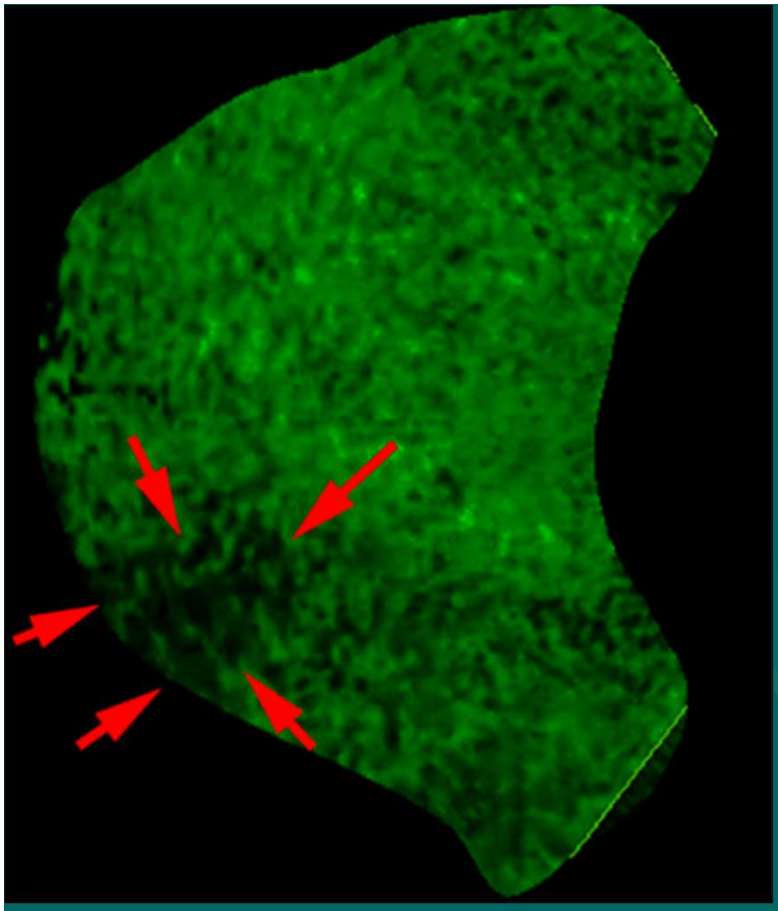

COOLING UNIT
CONSOLE
PROBE

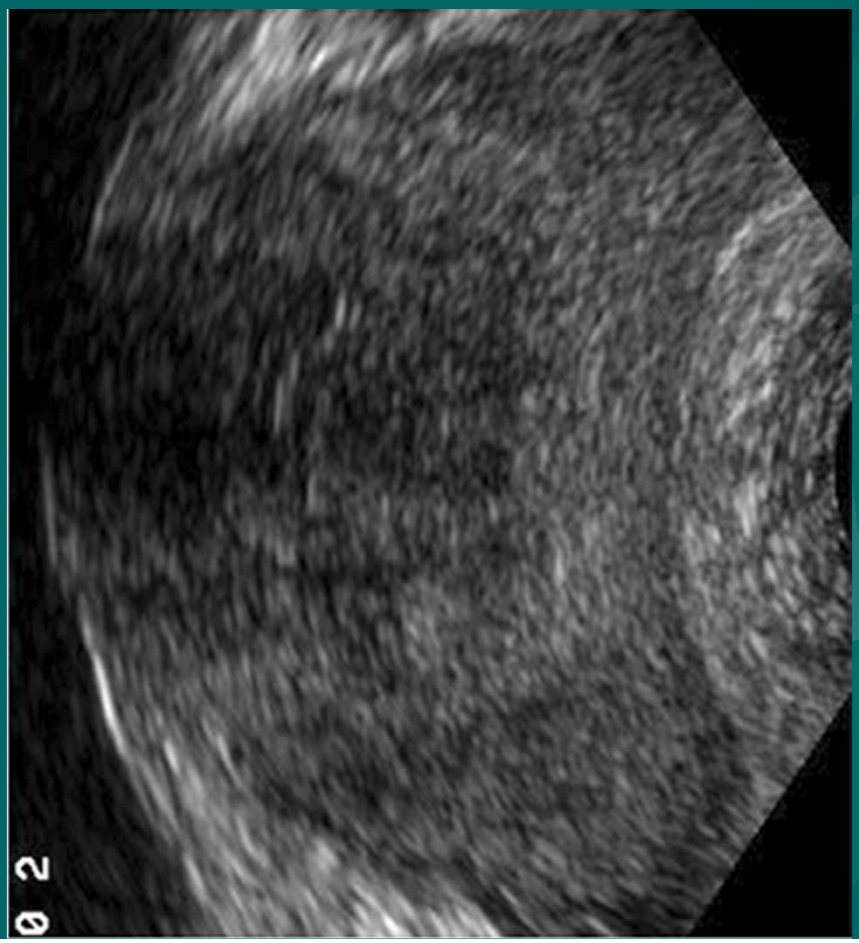




SONOELASTOGRAPHY







PET/ULTRASOUND IMAGING

TRUS provides anatomical detail in the prostate region that can be co-registered with the sensitive functional information from PET

TRUS has become an extension of the urologist's finger in early detection and to guide biopsy.

With further advances in technology TRUS will likely play a greater role in delivering therapies and reducing complications. The advanced stages of Prostate cancer might become a rare entity with judicious use of imaging technologies.


Thank you