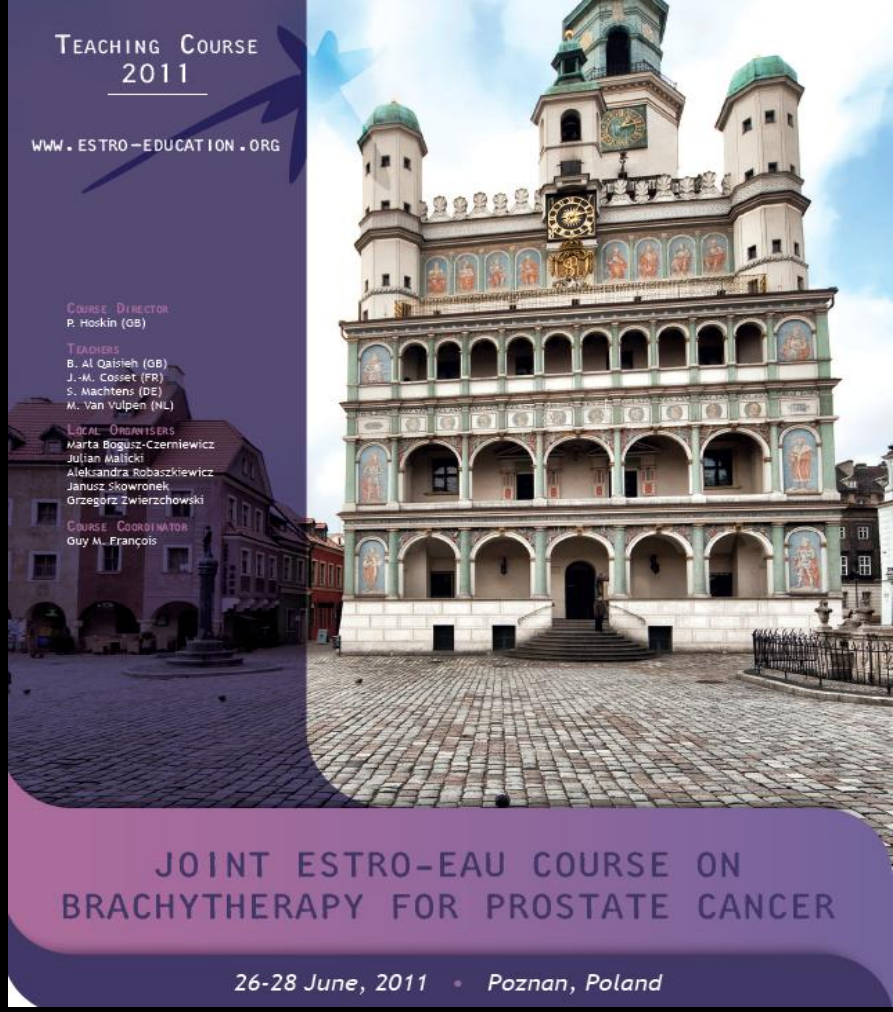
Prostate brachytherapy in Poland



Janusz Skowronek, MD, PhD, Ass. Prof.

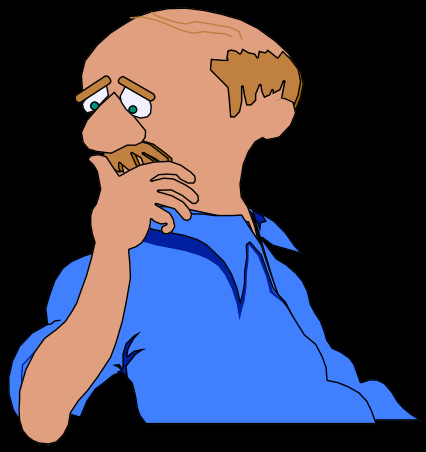
Greater Poland Cancer Center, Poznań, Poland

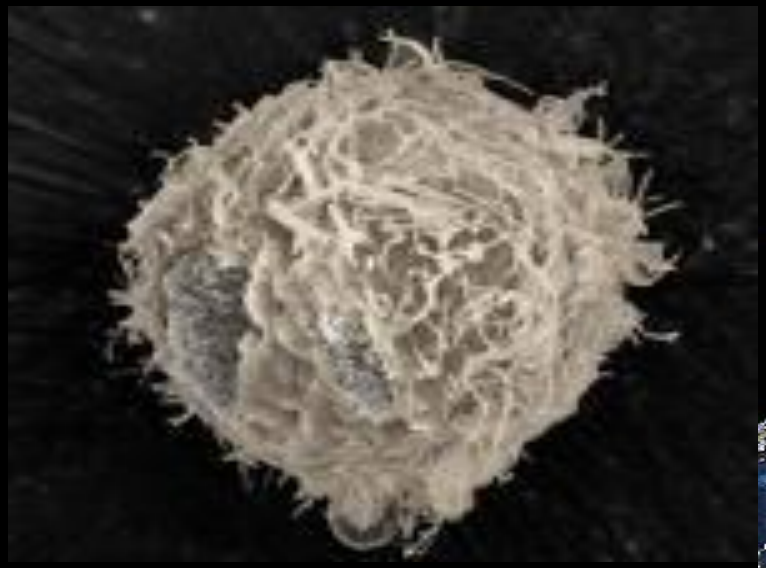
28.06.2011

Journal of Contemporary BRACHYTHERAPY
Journal of Polish Brachytherapy Society /// Published by Termedia sp. z o.o.

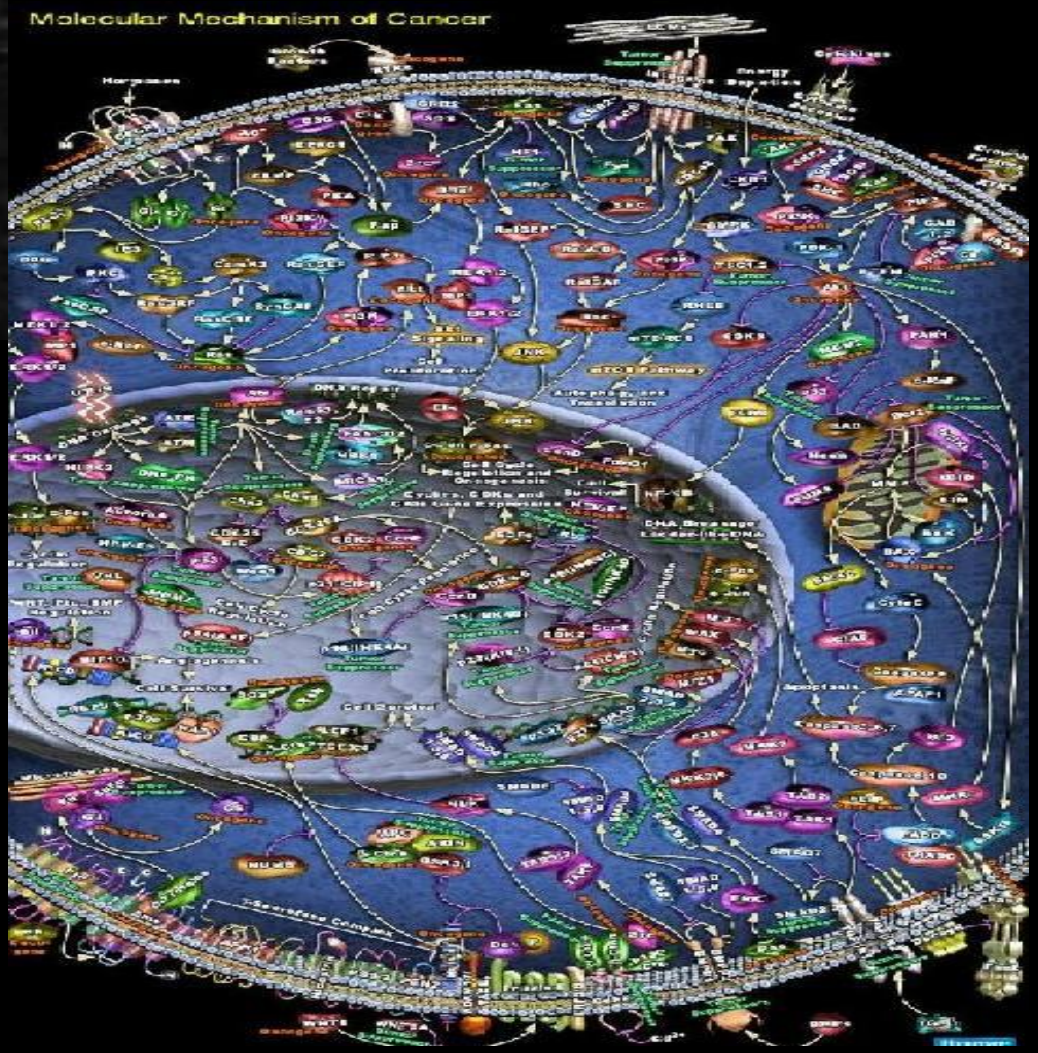
Patients want to be cured by the least invasive method, those little risk of recurrence, lower risk of complications reported, and maintaining the high quality of life…

?



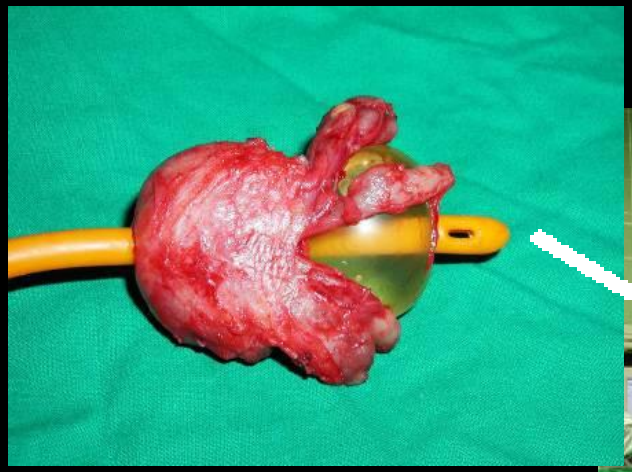


Beautiful pictures…



We are very happy, but…

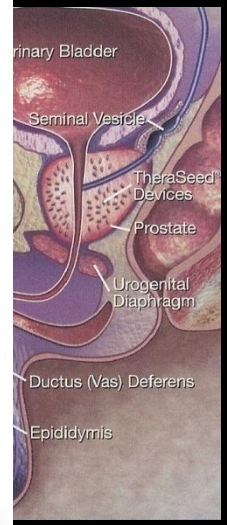
Urologists point of view…

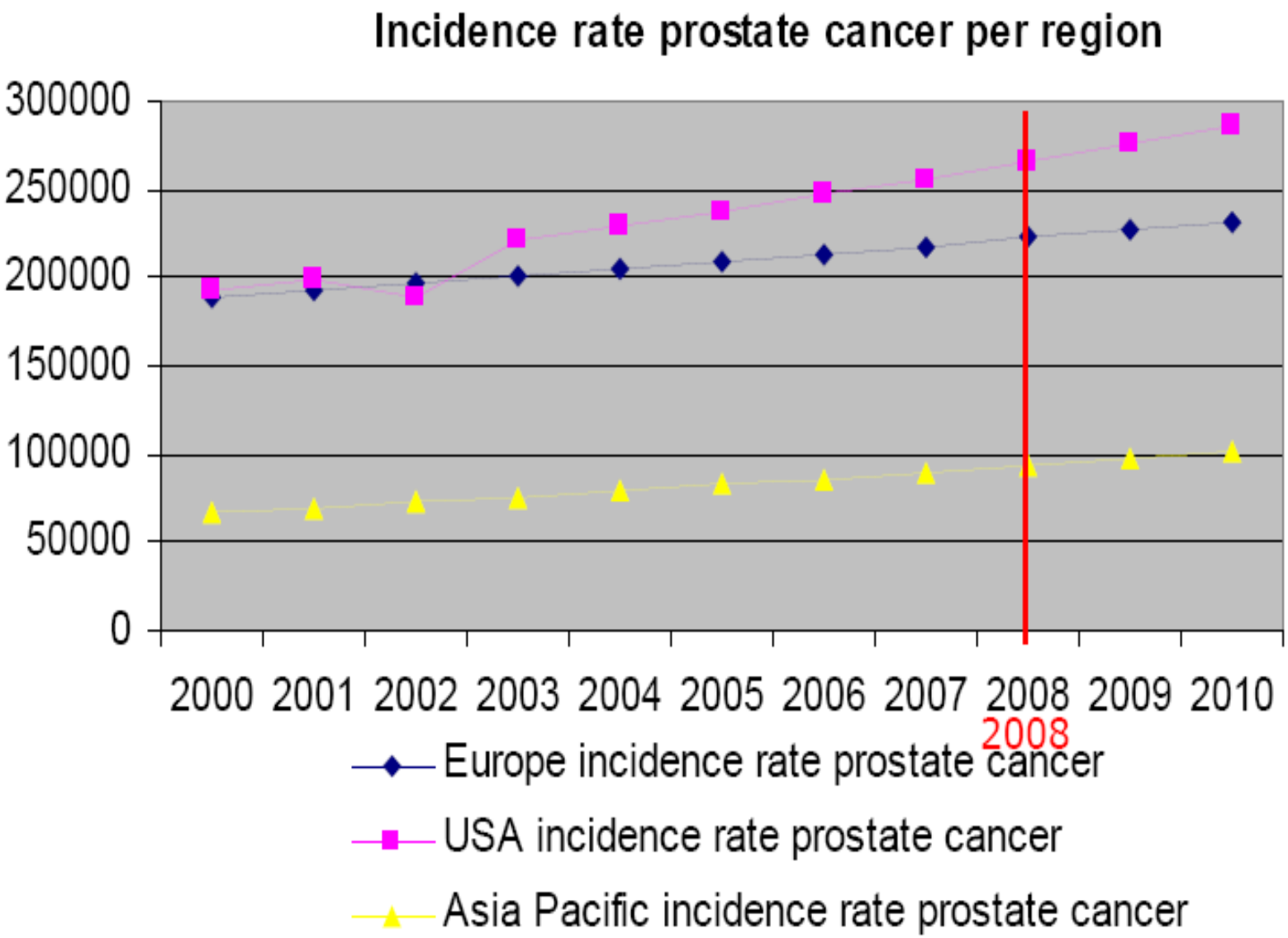


Our point of view..

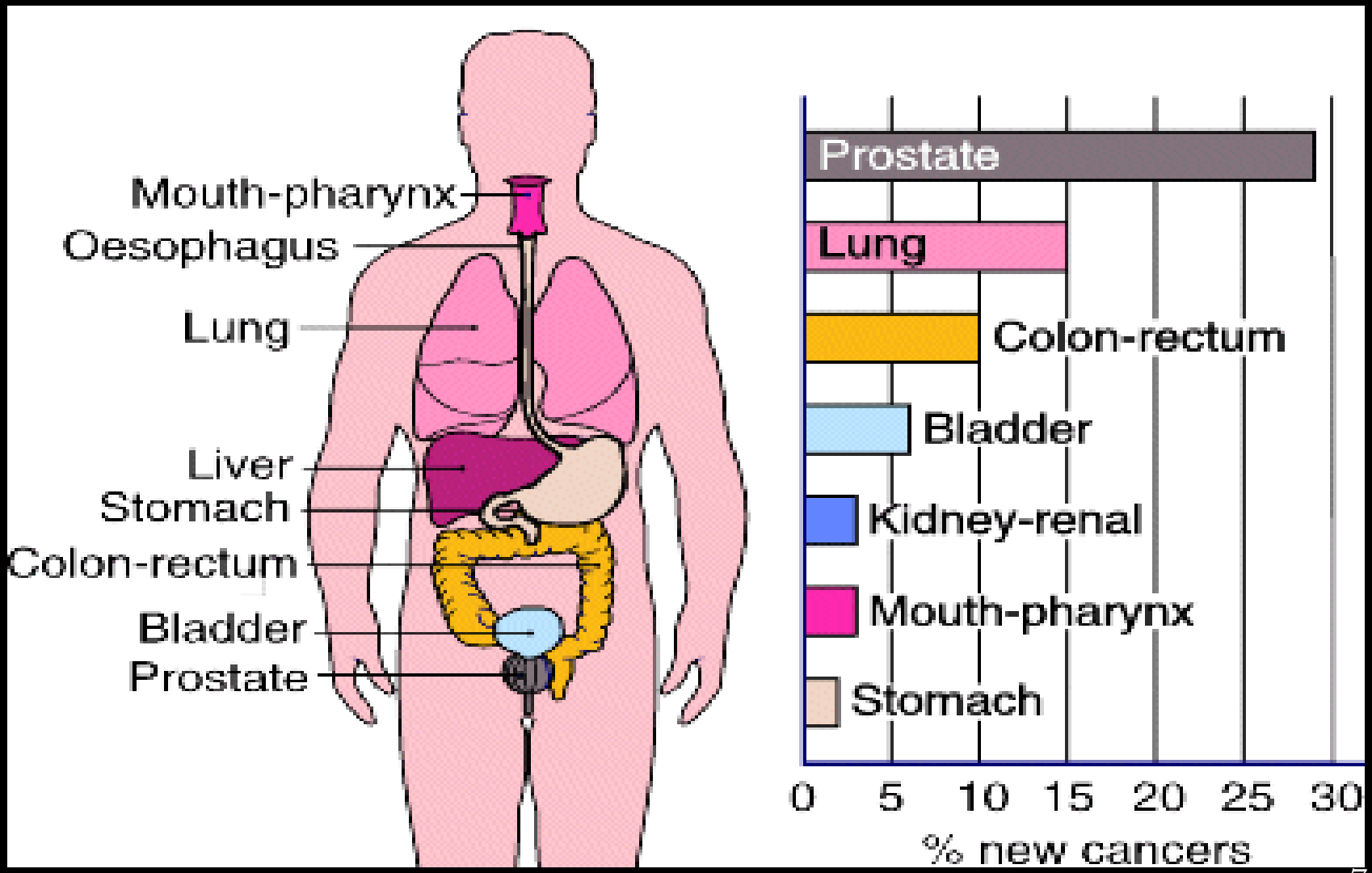
Greatest problem….

Impotence….




Incidence rate prostate cancer per region
300000
250000
200000
150000
100000
50000
0
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
2008
Europe incidence rate prostate cancer
USA incidence rate prostate cancer
Asia Pacific incidence rate prostate cancer

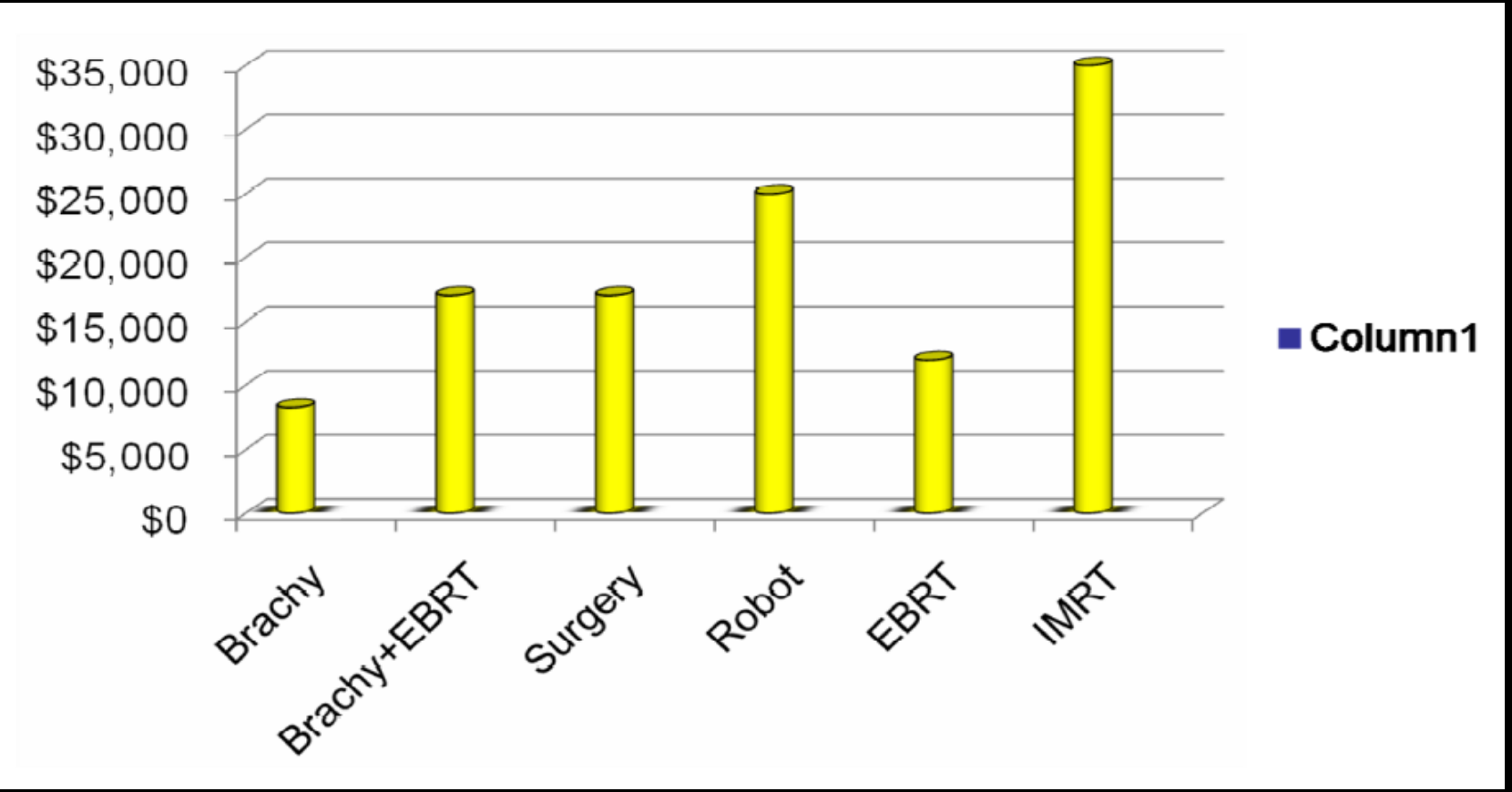
Prostate cancer – most frequent man cancer



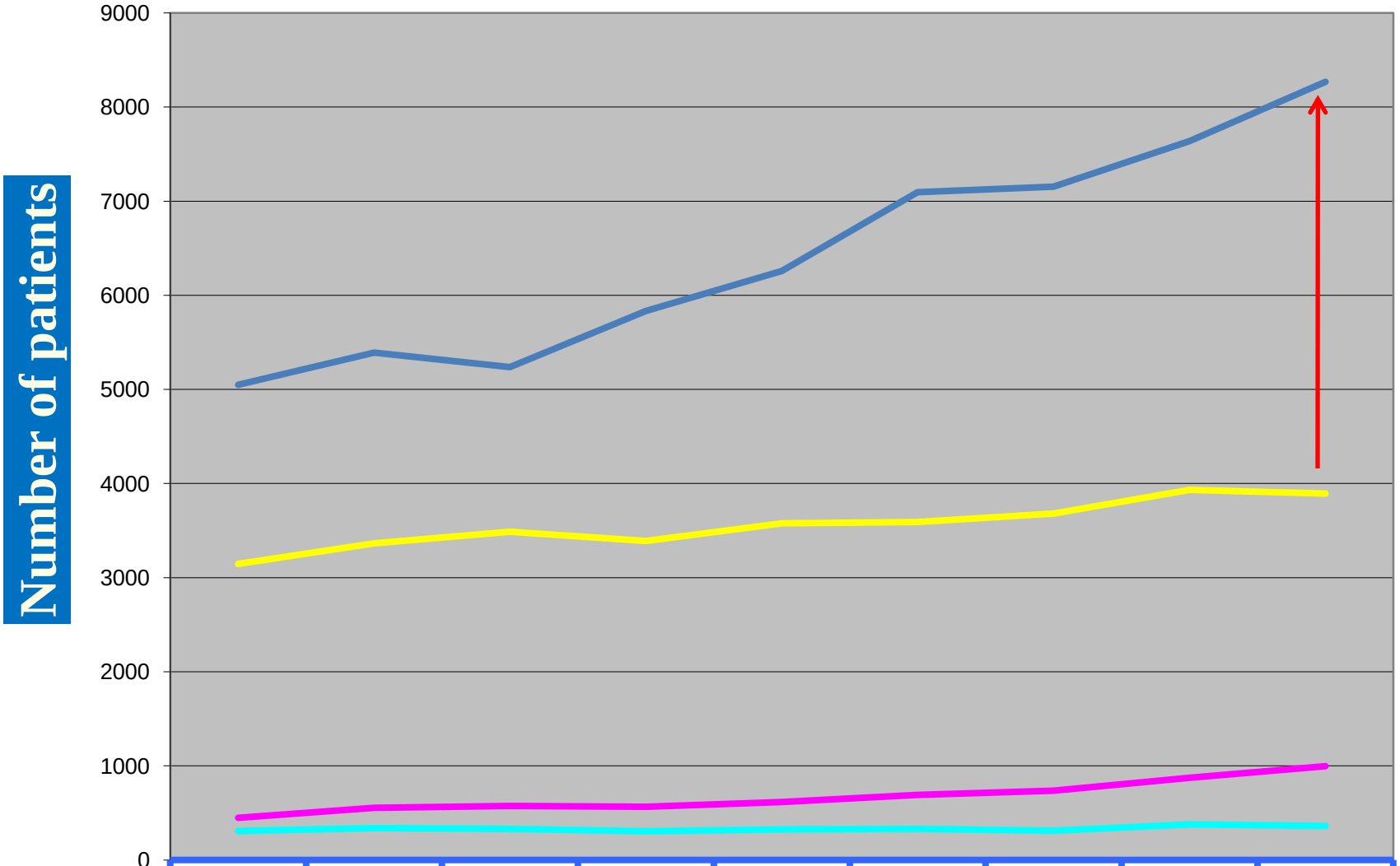
Costs

P-BIG Prostate Brachytherapy International Group

Luis A. Linares MD FACRO, EJGH, LA



Prostate cancer - morbidity, mortality in Poland



	2000	2001	2002	2003	2004	2005	2006	2007	2008
Morbidity - Poland	5049	5391	5236	5832	6257	7095	7154	7638	8268
Morbidity - Greater Poland	448	555	573	565	617	691	737	874	997
Mortality - Poland	3147	3365	3488	3390	3578	3592	3681	3932	3892
Mortality - Greater Poland	308	338	331	305	325	330	310	377	360

Brachytherapy of prostate cancer

Greater Poland Cancer Centre
(2006 - 2011)

HDR brachytherapy – 1398 procedures

Permanent implants – 63 patients (*since December 2008, no reimbursement*)

Permanent implants – first centre in Poland!

Seeds - nowadays:

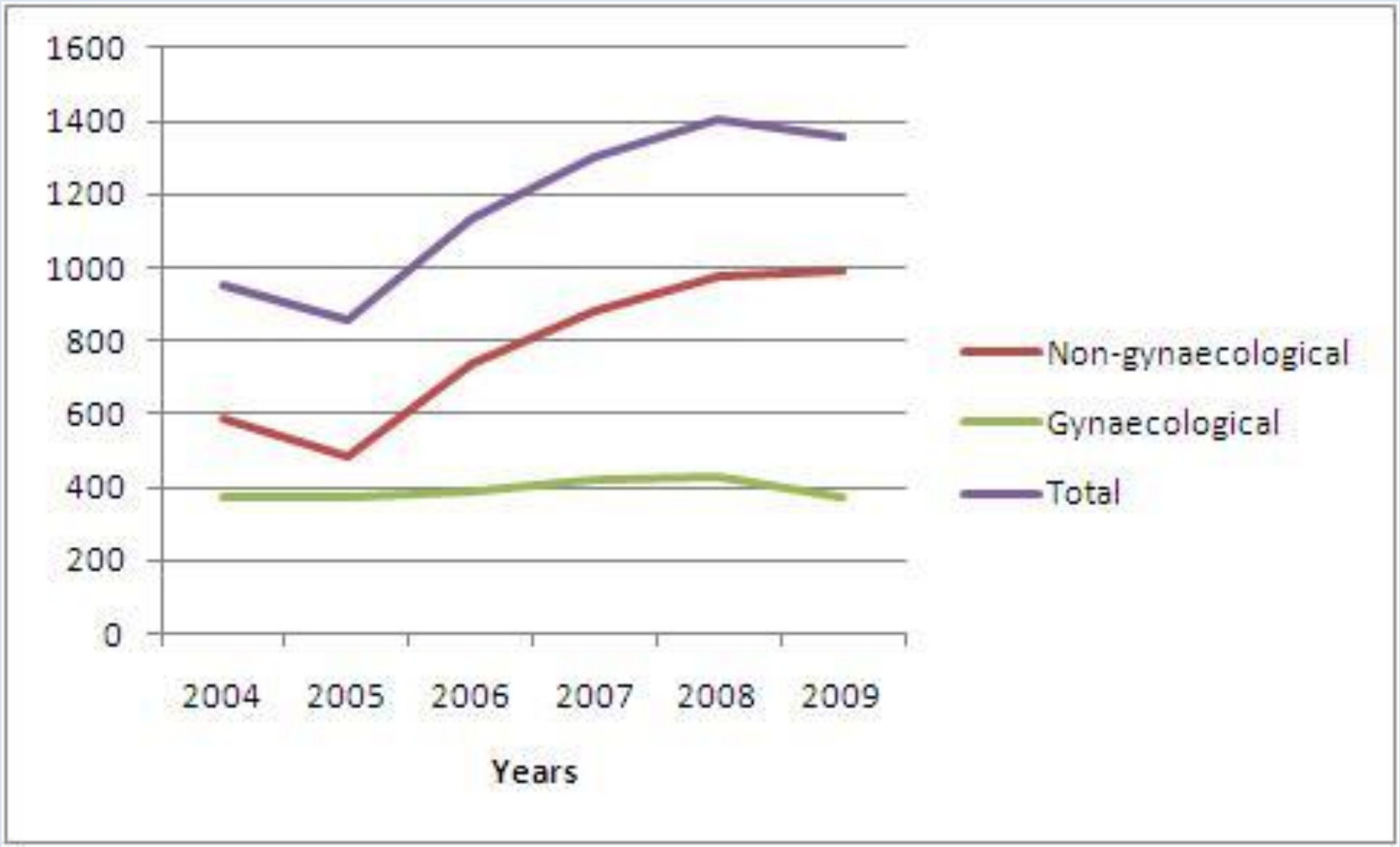
2 oncological centres (*Poznań*, ~~*Warsaw - stopped*~~),
1 private centre (*Jastrzębie Zdrój*)

Prostate brachytherapy in Poland

SWIFT

Centre	*2004*	*2006*	*2007*	*2010*
Kraków	0	36	36	48
Poznań	0	70	229	307 + seeds (15)
Białystok	0	5	31	36
Gliwice	67	67	44	36
Bydgoszcz	71	107	80	89
Brzozów	43	30	18	0
Kielce	24	30	30	52
Warszawa	93	87	114	94 + seeds (10)
Jastrzębie Zdrój (private)	-	-	-	seeds (14)
Wieliszew (private)				starts HDR 2011
Total	298	432	582	662

Brachytherapy in Greater Poland Cancer Centre



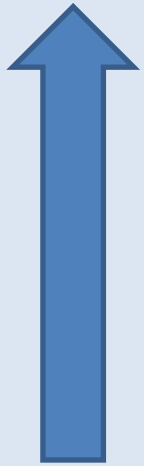
Brachytherapy in Poland - 2010

- External Beam Radiation Therapy – 63646 pts
- Brachytherapy – 9880 pts (15.5%)

Total – 73526 pts

- Morbidity (estimated) – 150-160 000 (?)
- 28/30 of RT centres use BT:

- WCO Poznań	1159
- Gliwice	926
- Kielce	908
- Bydgoszcz	882
- Warszawa	637



Poznań

1. Largest number of patients treated with BT in Poland,

2. The largest number of:

prostate

lung,

oesophagus,

breast,

head and neck,

skin cancers.

3. gynaecology - third place,

4. First Centre – seeds, Contura, SAVI (from August 2011),

5. Interstitial Hyperthermia with BT,

6. APBI, HDR prostate monotherapy – routine,

7. Endovascular BT - history.

Brachytherapy Department - equipment

- Microselectron HDR V3 – 2009
- Microselectron HDR classic – 2001/2008 (V3)
- Microselectron PDR - 1999
- Hyperthermia BSD-500 – 2006
- Phillips Endura RTG – 2006
- IBU – 1999
- Simulix Evolution - 2011

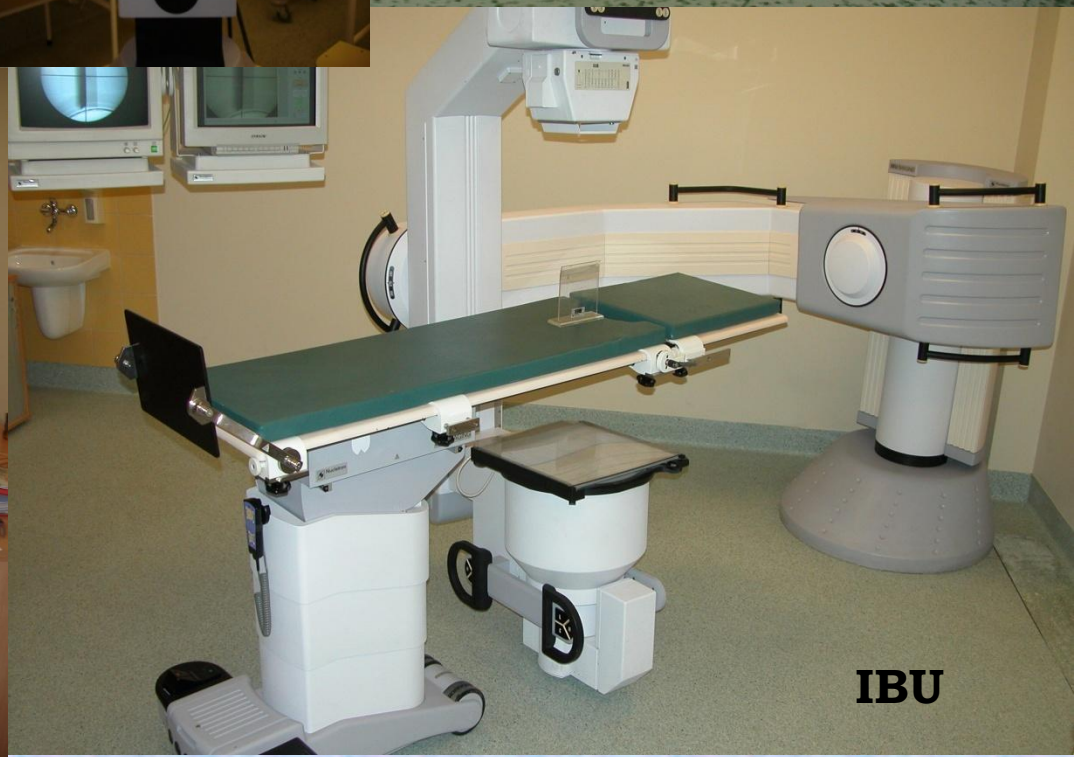
- PLATO vs. 14.1.3. – 2006
- Oncentra gynaecology, Oncentra Masterplan – 2008
- SWIFT „real-planning" System - 2006
- SWIFT/SPOT Combo planning system – 2008

- Seeds - 2008

- Microselectron PDR – 2012 (?)
- Oncentra 4.0 - 2011

HDR

Hipertermia



IBU

Brachytherapy Department

- **3 shielding rooms:**

  PDR,
  HDR I + SWIFT,
  HDR II + IBU (Simulix),
- **Operating room + SWIFT/SPOT,**
- **Laboratory of Treatment Planning and Brachytherapeutic Dosimetry**
- **Bronchoscopy laboratory,**
- **Hyperthermia laboratory,**
- **Out-patient Clinic,**
- **2 wards (6 beds),**
- **Duty-room,**
- **Nurse's station.**

Team

Physicians	**- 5 (during the course),**
	- 1 pulmonologist,
Physicists	**- 4**
X-ray technicians	**- 2**
Treatment nurses	**- 5**
Ward nurses	**- 8**
Secretary	**- 2**
Anesthetist	**- 1**
Nurse anesthetic	**- 1 - 2**

Greatpoland Cancer Center
08.05.1999 – 30.04.2007
(without gynaecological neoplasms)

3263 patients:

- **3165 patients – different neoplasms,**
- **17 patients - restenosis in femoro-popliteal arteries,**
- **81 patients – restenosis in coronary arteries.**

- **2905 patients (89.0%) - HDR,**
- **277 patients (8.5%) – PDR,**
- **81 patients (2.5%) – 32-P (restenosis in coronary arteries).**

BT - indications:

- **Radical treatment (n = 1088, 33.3%),**
- **Palliative treatment (n = 2175, 66.7%).**

2006	LDR	HDR	PDR	Total No of patients
Lung – Bronchus		231		231
Gynaecology: endometrium	196			196
Gynaecology: cervix	187			187
Gynaecology: vagina	7			7
Head and Neck		56	34	90
Breast		53	8	61
Anal – Rectum		3		3
Prostate (HDR)		70		70
Oesophagus		80		80
Skin		145	2	147
Soft tissue		1	3	4
"Other sites"		35	16	51
Total				1131

Greatpoland Cancer Center
08.05.1999 – 30.04.2007
(without gynecological neoplasm)

Most frequent neoplasms:

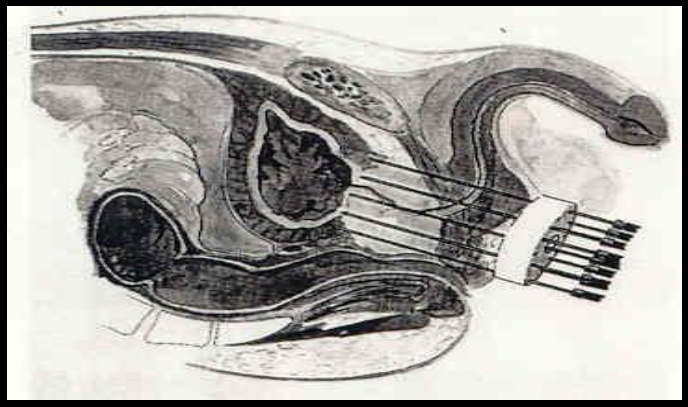
- **lung cancer** **(n = 1349, 41.3%),**
- **oesophageal cancer** **(n = 552, 16.9%),**
- **skin cancer** **(n = 438, 13.4%),**
- **head and neck cancer** **(n = 356, 10.9%),**
- **prostate cancer** **(n = 146, 4.5%),**
- **breast cancer** **(n = 140, 4.3%),**
- **brain tumors** **(n = 54, 1.7%).**

Radical brachytherapy:

- restenosis in femoro-popliteal arteries and in coronary arteries (n = 98, 100%),
- prostate cancer (n = 146, 100%)
- skin cancer (n = 401, 91.6%),
- breast cancer (n = 125, 89.3%),
- anal cancer (n = 11, 55%),
- head and neck cancer (n = 175, 49.2%),
- rarely: lung cancer (n = 88, 6.5%),
  oesophageal cancer (n = 25, 4.5%).

Palliative brachytherapy:

- brain tumors (100%),
- pancreas, bile duct cancer (95.5%),
- oesophageal cancer (95.5%),
- lung cancer (93,5%),
- head and neck cancer (50.8%).



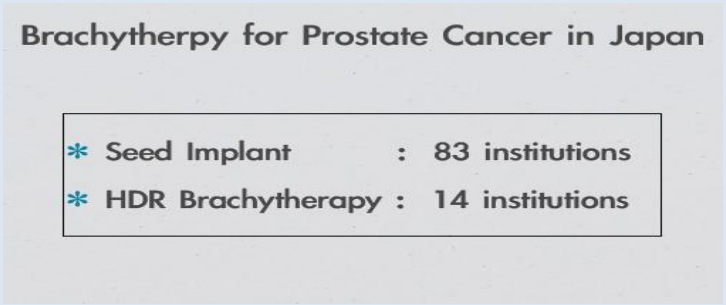
Prostate cancer

	USA (2010)	Europe (2004)	Poland (2008)
Morbidity	217.730	240.000	8.268
	14,7%	35,4%	47,1%
Mortality	32.050	85.000	3.892

Japan – 15.1/100.000 → Sveden – 81.8/100.000

* *Ca Cancer J Clin, 2010*
* *PCBE Reports, Guedea, RO 2010*

Japan - 2007



Legalized from 2003 - the number of patients treated with permanent **seed** implantation for prostate cancers has rapidly increased.

There were **214 BT facilities** in April 2007.
There were **206 remote afterloading** units installed:

The total number of BT patients in 2006 **- 6529** (HDR: 3882, LDR: 2638, MDR: 9)

1. **Gynecology (3012)** (HDR: 2889, LDR: 114, MDR: 9),

2. Prostate (2669) (HDR: 564, LDR 2105),

3. Head and neck (348) (HDR: 83, LDR: 265),
4. others (500) (HDR: 346, LDR: 154).

Netherlands – 2007

Patterns of care study for brachytherapy: results of the questionnaire for the years 2002 and 2007 in The Netherlands
Jack L.M. Venselaar, Ben J. Slotman, Ferran Guedea, Montse Ventura, Bradley Londres, Guy Francois
J Contemp Brachyther 2010; 2, 4: 145-152

- HDR - 15 units
- PDR - 13 units
- LDR - 2 units
- Manual wire technique – 4 centres
- 87 BT radiotherapists → **2460 BT** patients

Permanent prostate implants – 13/21 centres

1030 prostate patients were treated in 2007 using ^{125}I seeds

- 2 institutions reported the use of both **stranded and loose seeds**,
- 11 used **stranded seeds** only

- 20 cases - PDR
- **22 with - HDR**

Patterns of care for brachytherapy in Europe: Updated results 2002 - 2007

Ferran Guedea, Jack Venselaar, Peter Hoskin, Taran Paulsen Hellebust, Didier Peiffert, Bradley Londres, Montse Ventura, Jean-Jacques Mazeron, Erik Van Limbergen, Richard Pötter, Gyorgy Kovacs

Radiotherapy and Oncology 97 (2010) 514–520

Prostate cancer

	No. patients	No. centres	LDR	MDR	PDR	HDR
Overall	7940	806	5890 (74.2%)	223 (2.8%)	45 (0.6%)	1782 (22.4%)
Group I						1179
Group II	672					603
Group III						

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Monaco, The Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom

Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia.

Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Georgia, Israel, Macedonia, Moldova, Montenegro, Romania, Serbia, Turkey

Patterns of care for brachytherapy in Europe: Updated results

Ferran Guedea, Jack Venselaar, Peter Hoskin, Taran Paulsen Hellebust, Didier Peiffert, Bradley Londres, Montse Ventura, Jean-Jacques Mazeron, Erik Van Limbergen, Richard Pötter, Gyorgy Kovacs

Radiotherapy and Oncology 97 (2010) 514–520

Prostate cancer 2007 (17% of BT in Europe)

- gynaecological (59%), **prostate (17%),** breast (9%), lung/bronchus (3%), and esophagus (2%).

In group I

- the five most common tumor sites were as follows: gynaecological (48%), **prostate (26%),** breast (12%), eye (3%), and esophagus (2%).

Greater Poland Cancer Centre (2009)

Gynaecological 371 (26.6%),

non-gynaecological 1024 (73,4%)

prostate 322 (23.1%)

Patterns of care for brachytherapy in Europe: Updated results

Ferran Guedea, Jack Venselaar, Peter Hoskin, Taran Paulsen Hellebust, Didier Peiffert, Bradley Londres, Montse Ventura, Jean-Jacques Mazeron, Erik Van Limbergen, Richard Pötter, Gyorgy Kovacs

Radiotherapy and Oncology 97 (2010) 514–520

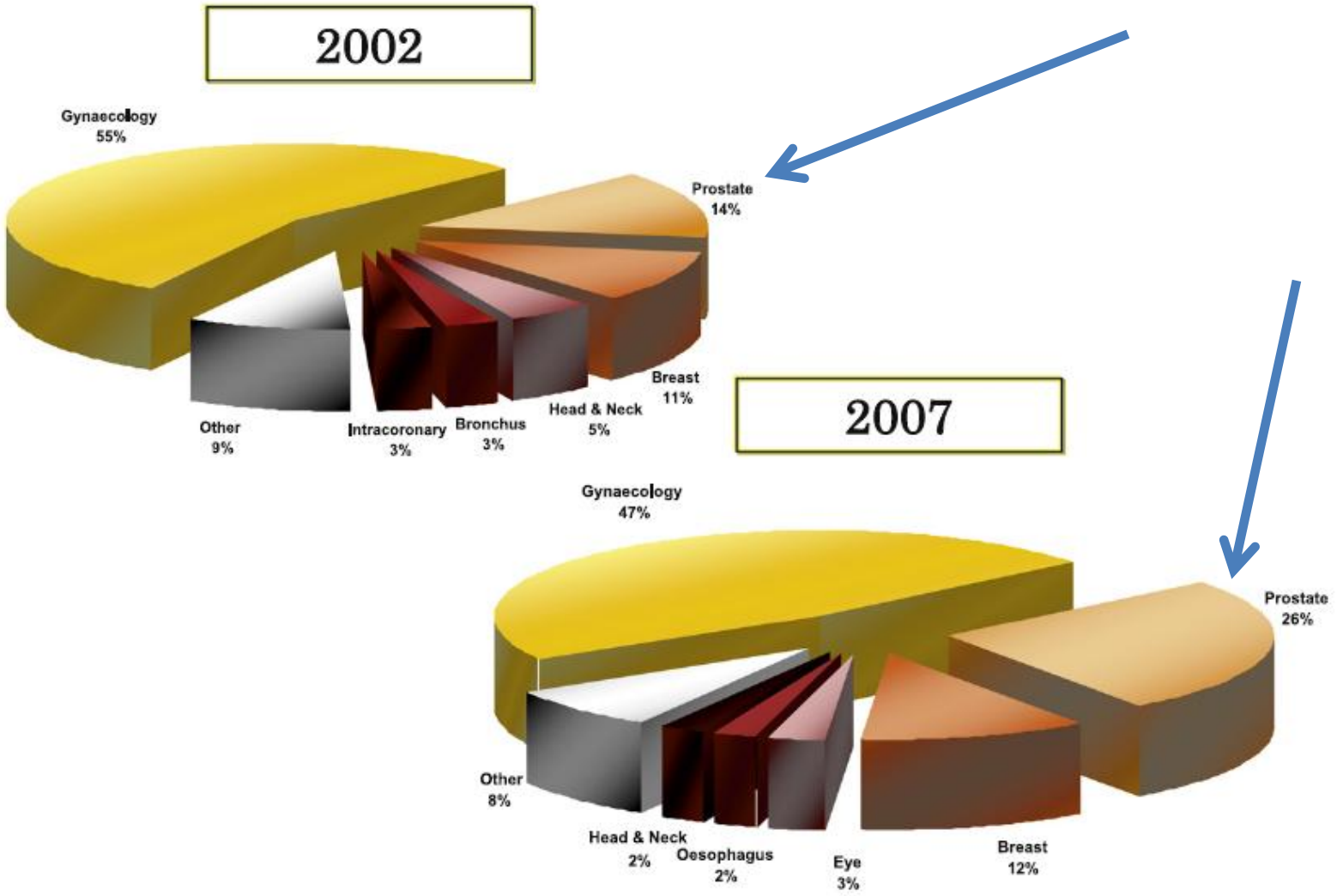


Fig. 3. Most common treatment localizations, group I (2002 vs. 2007).

HDR brachytherapy

> 10 YEARS AGO

Radical prostatectomy

or

External beam irradiation

10 YEARS AGO

Radical prostatectomy

or

Conventional external beam

or

Conformal external beam

or

Brachytherapy

or

Brachytherapy/external beam

TODAY

Radical prostatectomy

Nerve sparing prostatectomy

Laparoscopic prostatectomy
Robotic surgery

or

Conventional external beam

3-D

IMRT

Proton

Conformal external beam

IGRT

High-dose conformal

Dose escalation

High dose rate

Brachytherapy

Hypofractionation

Low dose rate

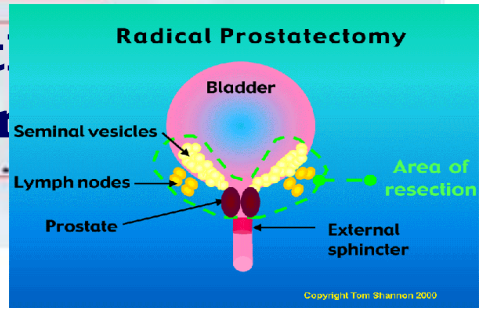
Brachytherapy/external beam

HIFU

RITA

Any of the above wit androgen deprivatio

Cryotherapy



Poznań – brachytherapy techniques

1. ~~LDR (Low Dose Rate) 1-2 mCi/cm (0,4 - 2 Gy /h)~~
   - PDR (Pulsed Dose Rate) 1 Ci/cm (0,5 - 1 Gy/h)

2. HDR (High Dose Rate) 10 Ci/cm (>12 Gy /h)
3. ultra LDR (seeds) (0 – 0,3 Gy/h).

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Radiotherapy and Oncology 74 (2005) 137–148

RADIOTHERAPY & ONCOLOGY
JOURNAL OF THE EUROPEAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY

www.elsevier.com/locate/radonline

GEC/ESTRO-EAU recommendations on temporary brachytherapy using stepping sources for localised prostate cancer

György Kovács[a,*], Richard Pötter[b], Tillmann Loch[c], Josef Hammer[d], Inger-Karine Kolkman-Deurloo[e], Jean J.M.C.H. de la Rosette[f], Hagen Bertermann[g]

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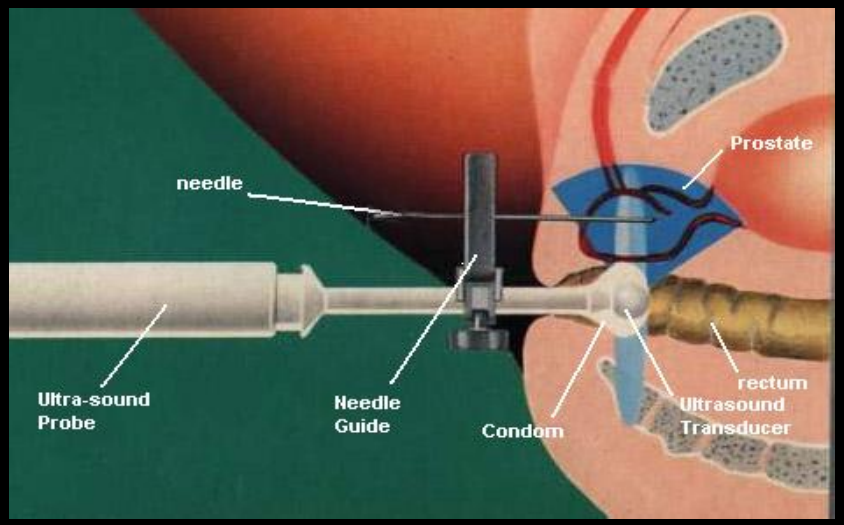
[g]*Department of Urology, City Hospital, Kiel, Germany*

Received 3 August 2004; accepted 2 September 2004
Available online 22 October 2004

HDR brachytherapy: diagnostic, equipment, team

- similar to seeds



Team in Poznań

Experience in:

1. **TRUS (done by radiotherapist),**
2. **Dosimetry, treatment planning,**
3. **Needles (seeds) implantation (radiotherapist),**
4. **Radiotherapy knowledge.**

Team:

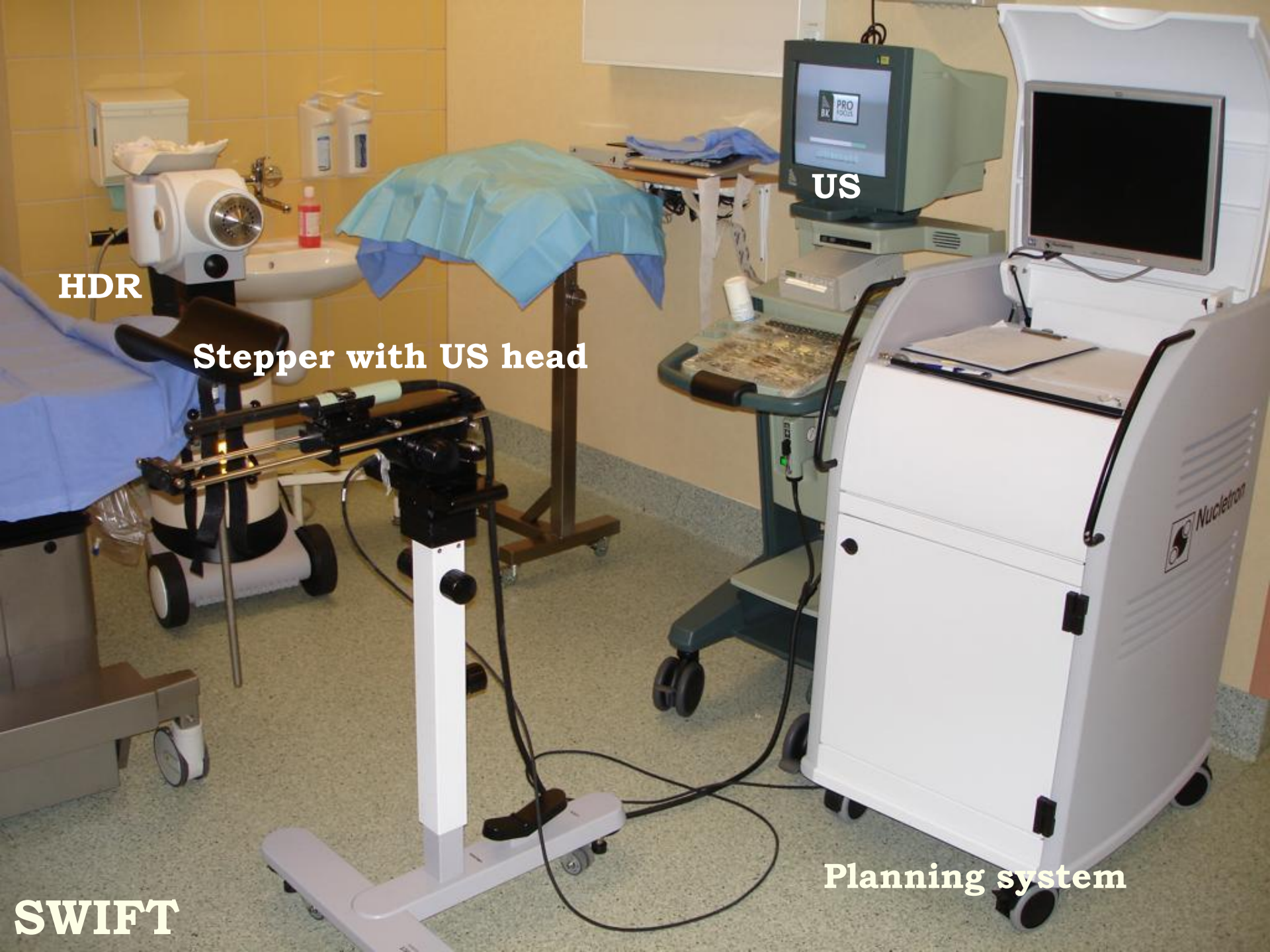
1. **radiation oncologist,**
2. **urologist, radiologist or radiation oncologist with ultrasound skills,**
3. **physicist,**
4. **2-3 nurses,**
5. **anesthetist,**
6. **nurse anesthetic,**
7. **X-ray technician.**

Minimum!!!!!!!

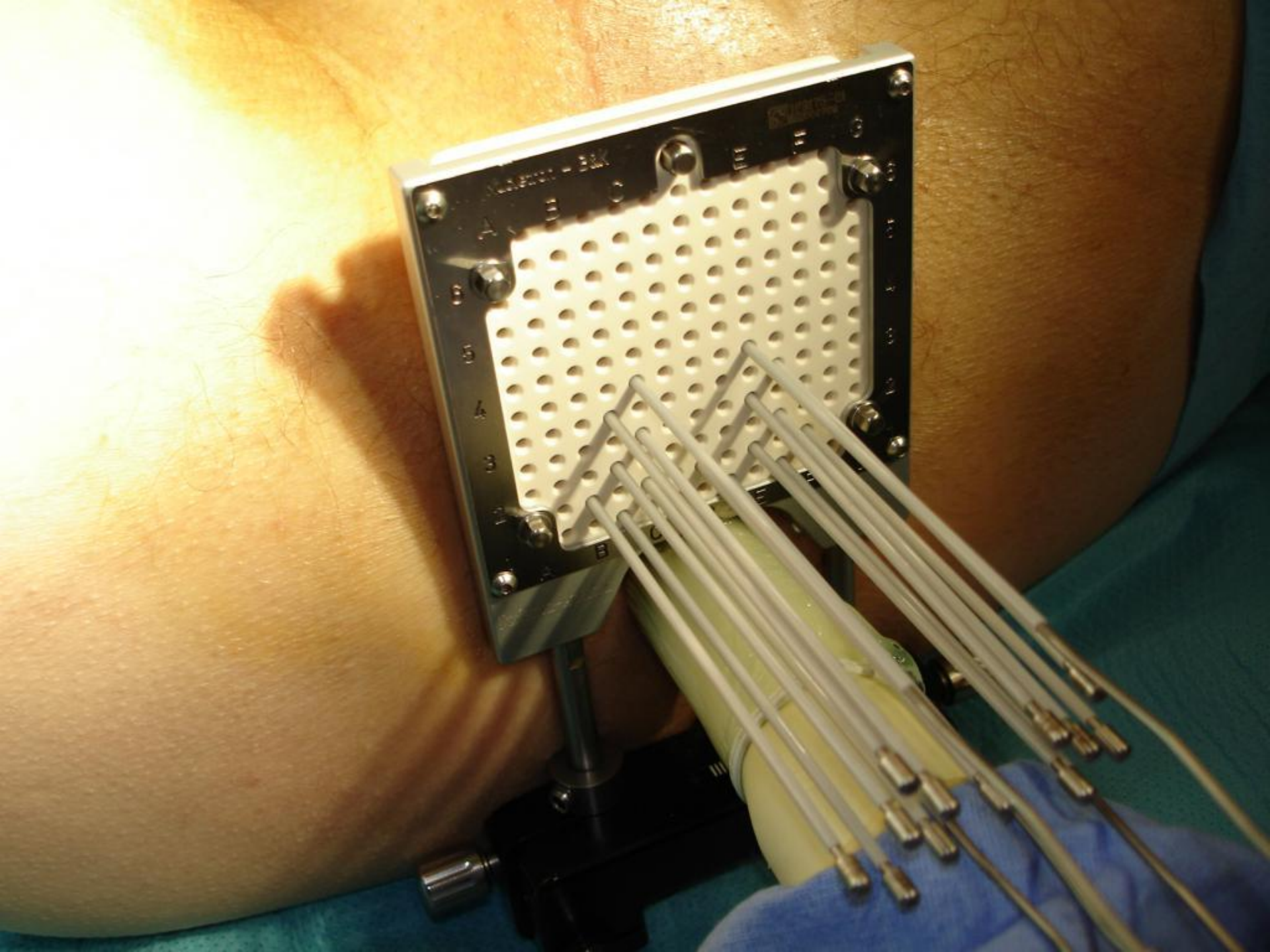
Brachytherapy - equipment

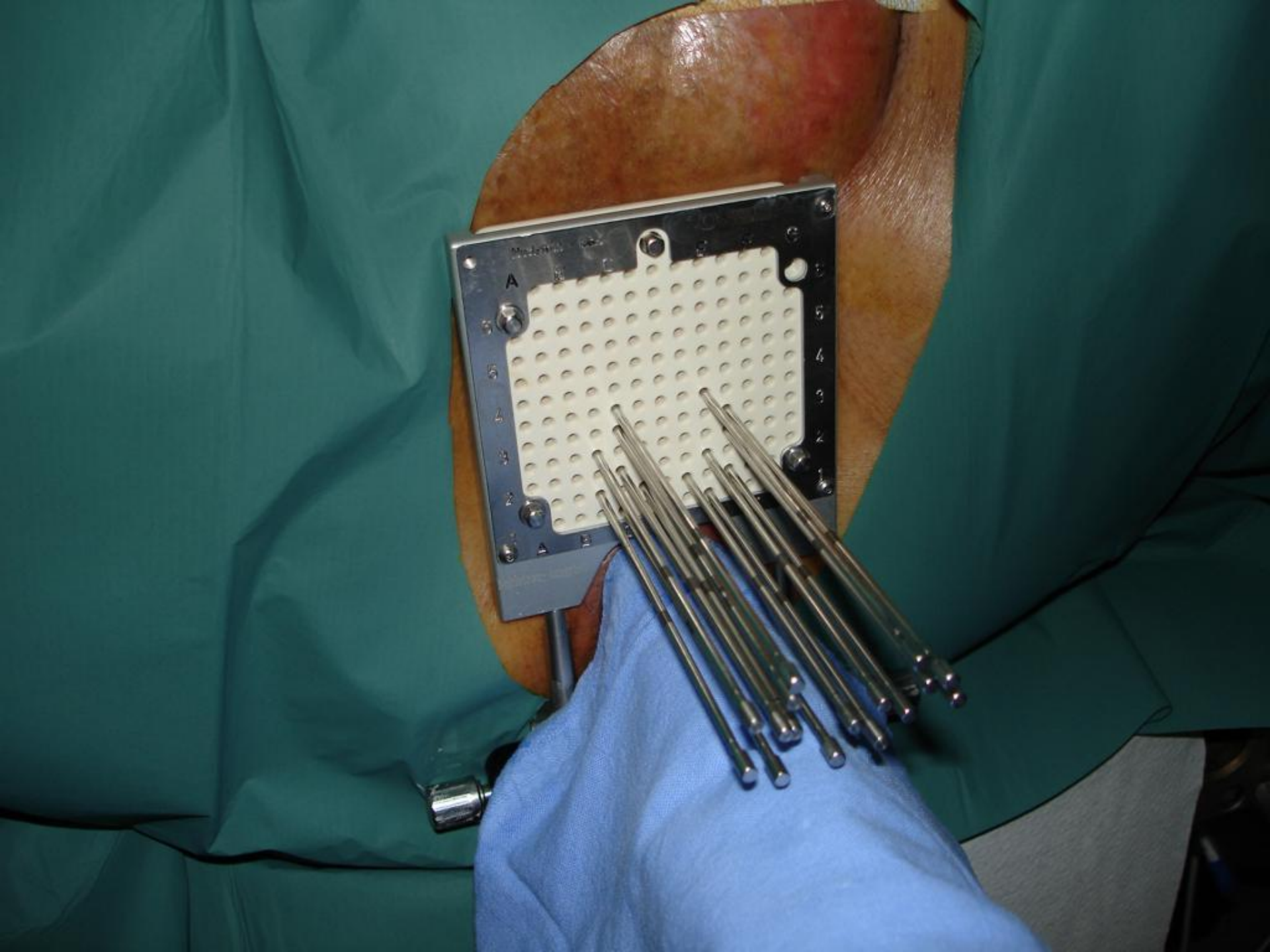
High quality - image guided source placement

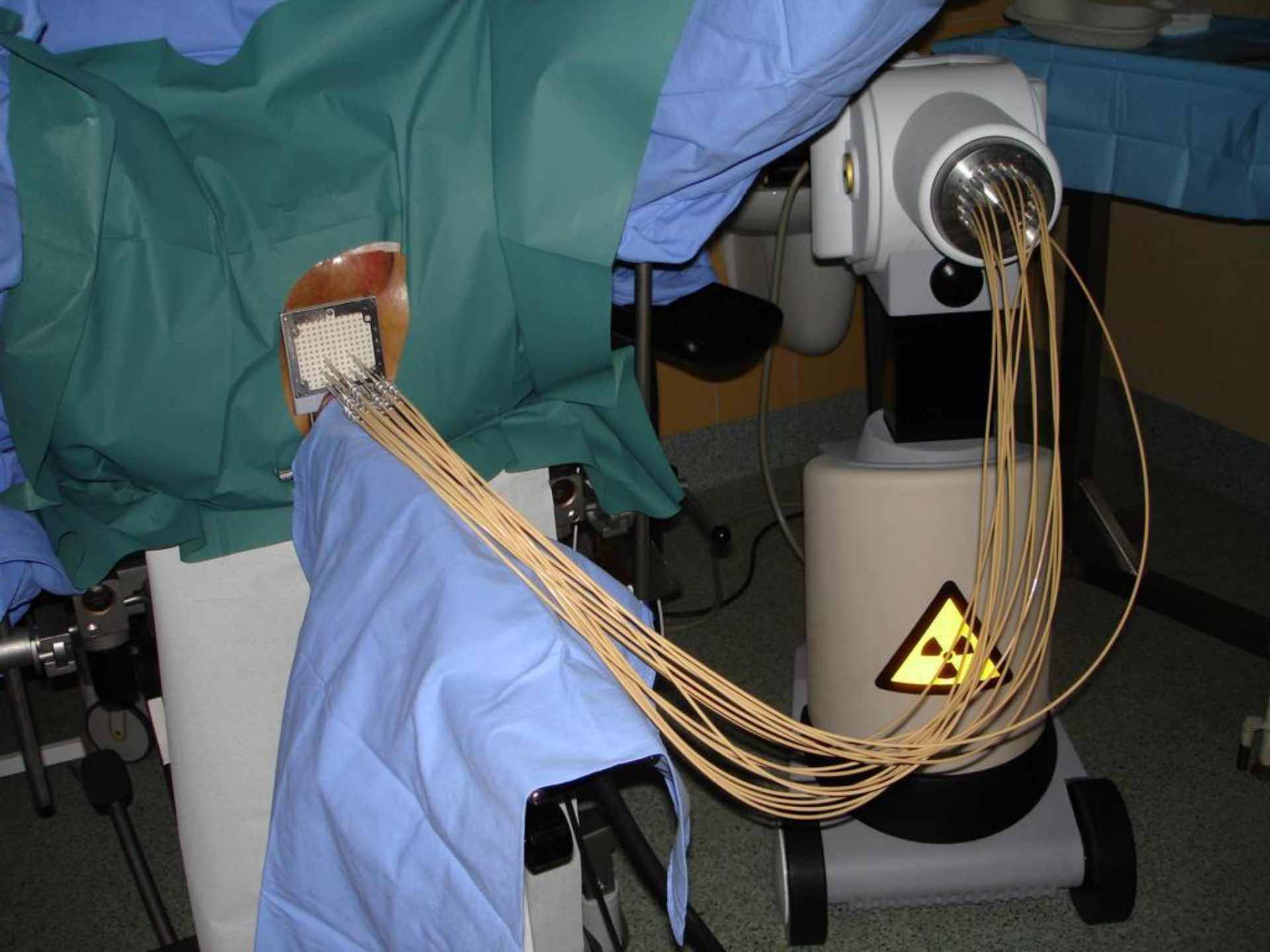
- **High quality digital TRUS with template software,**
- **X-ray/CT for post-implant dosimetry,**
- **Stepper, stepping unit,**
- **Treatment planning system.**


US
HDR
Stepper with US head
Nucletron
Planning system
SWIFT


C 55 b 15
E 35 cm 15
C 3 d 1.5
e 3 e 1.5
b 25 C 1
e 15 D 1
C 2* E 1
E 2*
F 2







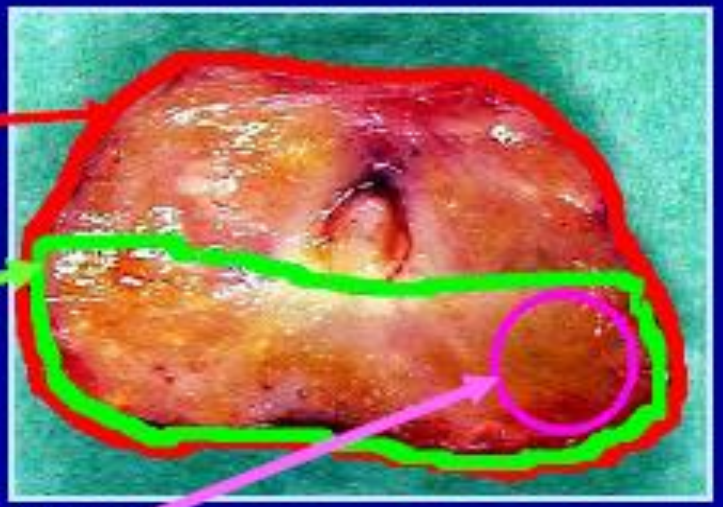
Dose Prescription: IMBRT

Different Target and Treatment Philosophies:

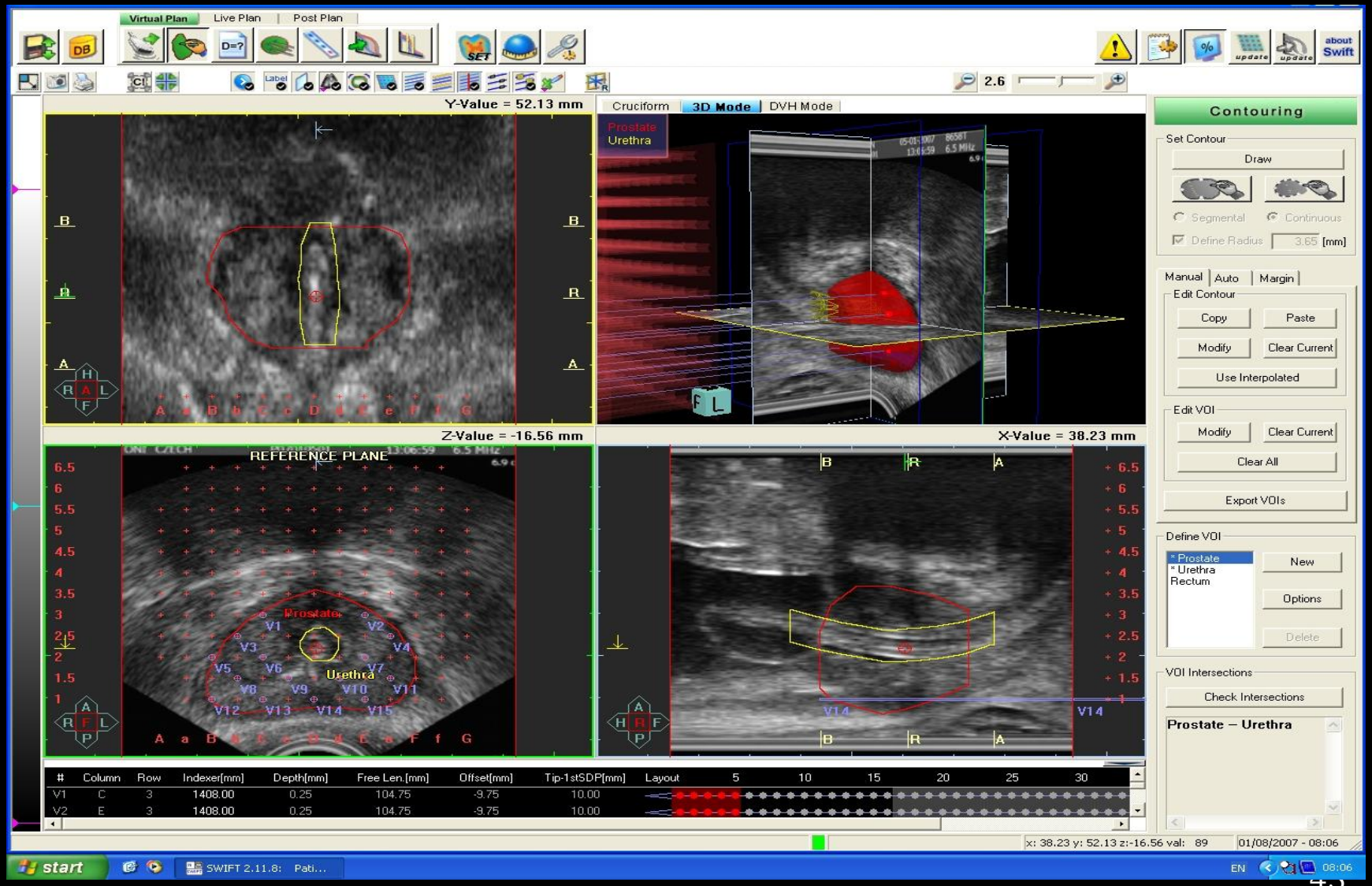
CTV 1 → Prostate Capsule

CTV 2 → Peripheral Zone

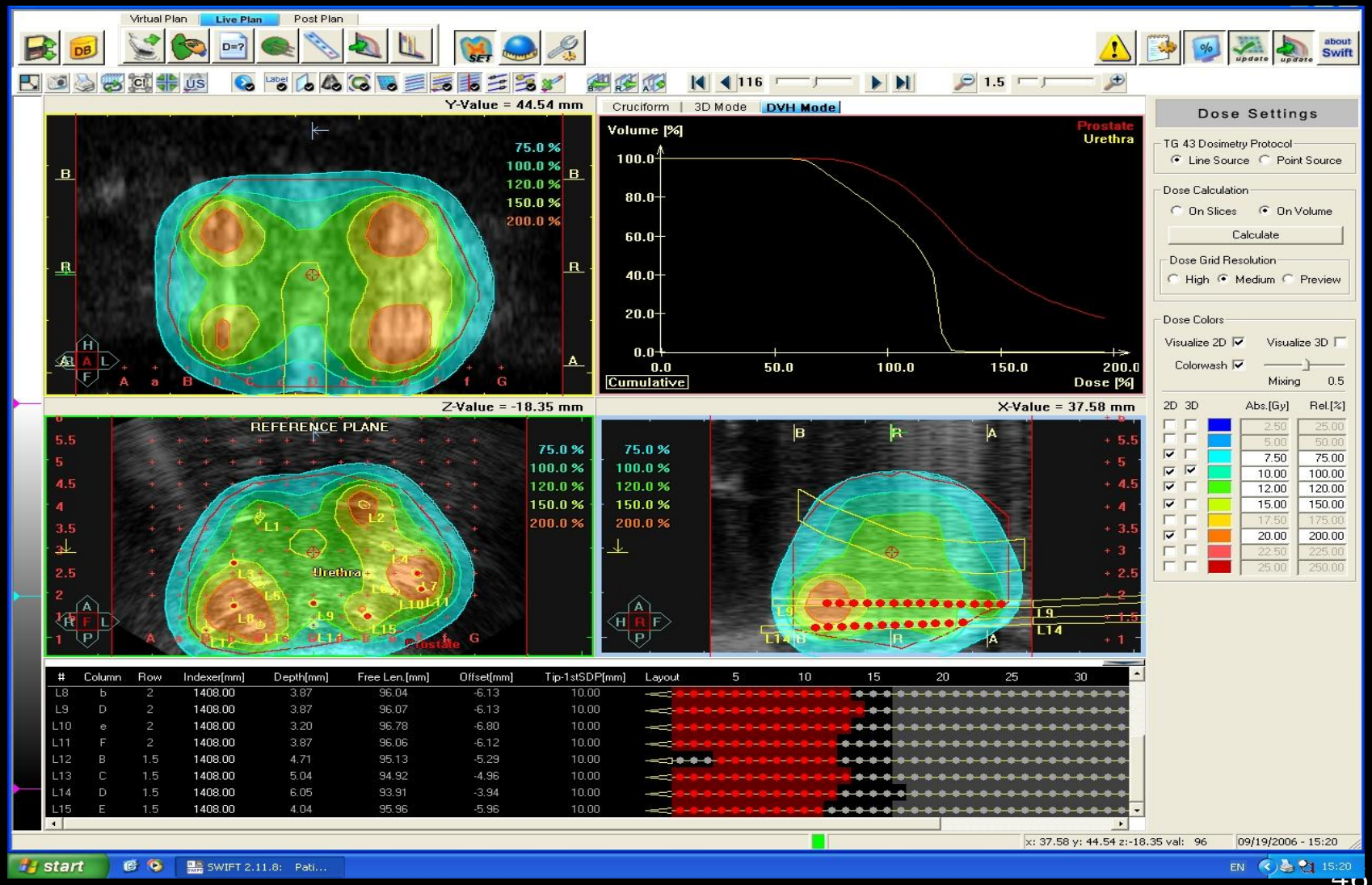
CTV 3 → Visible Tumor Infiltration



„Virtual planning”



„Real-time planning”

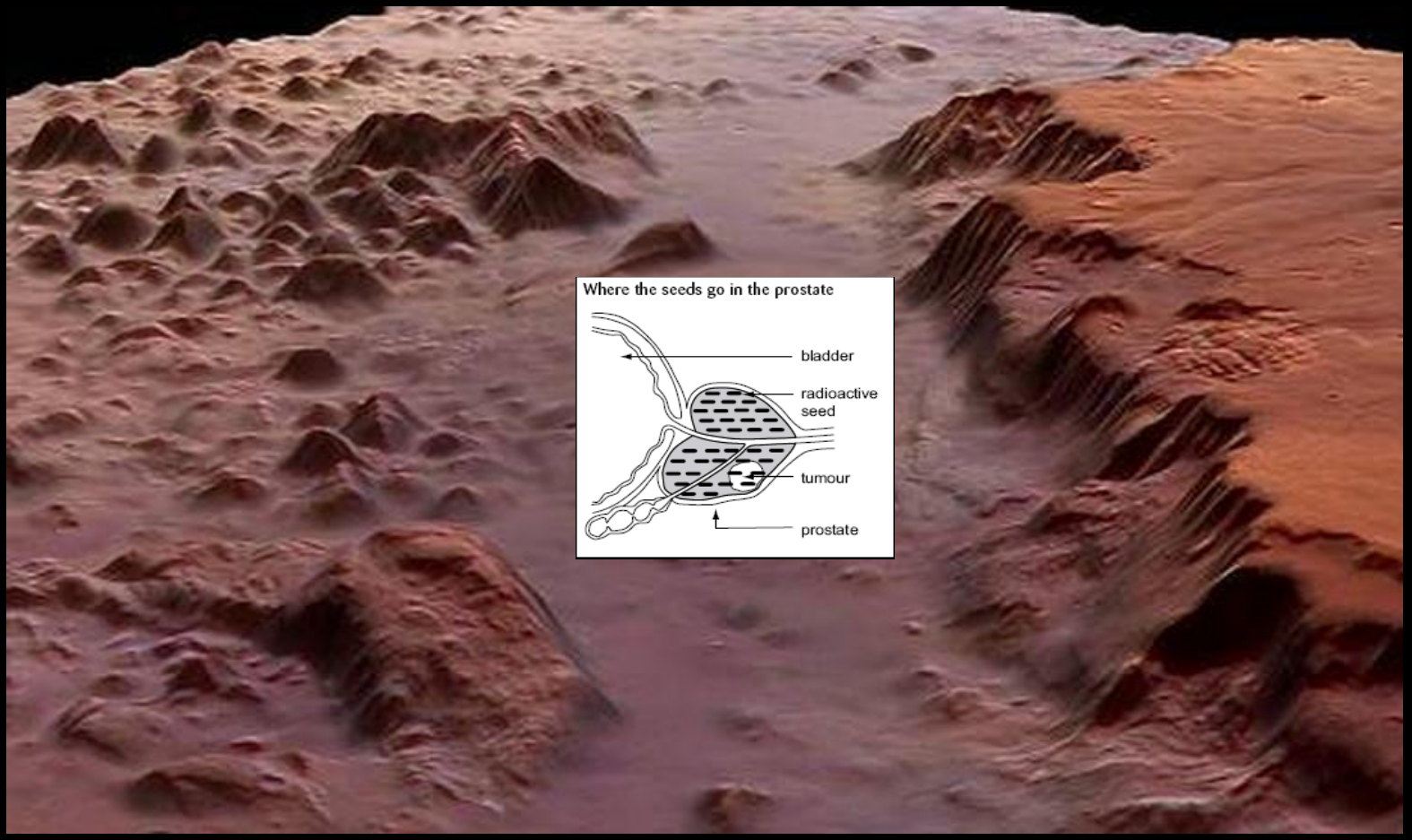


Conclusions

Remote temporary afterloading brachytherapy has several advantages:

- **accurate positioning of the source by first implanting non-active guide needles,**
- **possibility to choose the source positions over the length of the needle,**
- **no target movement during radiation,**
- **stepping source technology allowing for dose and volume adaptation due to adjustment of source dwell locations and times according to 3D imaging based individual dose prescription before irradiation,**
- **shortening the time and costs.**

I-125 Seeds


Where the seeds go in the prostate
bladder
radioactive seed
tumour
prostate

Int. J. Radiation Oncology Biol. Phys., Vol. 44, No. 4, pp. 789–799, 1999

0360-3016/99/$–see front matter

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PII S0360-3016(99)00069-3

CLINICAL INVESTIGATION **Prostate**

AMERICAN BRACHYTHERAPY SOCIETY (ABS) RECOMMENDATIONS FOR TRANSPERINEAL PERMANENT BRACHYTHERAPY OF PROSTATE CANCER

SUBIR NAG, M.D.,*† DAVID BEYER, M.D.,*‡ JAY FRIEDLAND, M.D.,*§ PETER GRIMM, D.O.,*‖ AND RAVINDER NATH, PH.D.*¶

*Prostate Brachytherapy Quality Assurance Group, Clinical Research Committee, American Brachytherapy Society, Reston, VA; †The Ohio State University, Columbus, OH; ‡Arizona Oncology Services, Phoenix, AZ; §Moffitt Cancer Center, Tampa, FL; ‖Swedish Medical Center, Seattle, WA; and ¶Yale University, New Haven, CT

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JOURNAL OF THE EUROPEAN SOCIETY FOR THERAPEUTIC RADIOLOGY AND ONCOLOGY

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ESTRO/EAU/EORTC recommendations on permanent seed implantation for localized prostate cancer

Daniel Ash[a,*], Anthony Flynn[a], Jan Battermann[b], Theodorous de Reijke[c], Paulo Lavagnini[d], Leo Blank[e]

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[b]*Department of Radiotherapy, Academisch Ziekenhuis, Utrecht, Germany*
[c]*Department of Urology, Academisch Medisch Centrum, Amsterdam, The Netherlands*
[d]*Instituto Tumori, Genoa, Italy*
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	Recommended Do well	Optional Fair	Investigational Do poorly
PSA (ng/ml)	< 10	10-20	>20
Gleason score	5-6	7	8-10
Stage	T1c-T2a	T2b-T2c	T3
IPSS	0-8	9-19	>20
Prostate volume (g)	<40	40-60	>60
Q_{max} ml/s	>15	15-10	<10
Residual volume cm^3			>200
TURP ±			+

National Comprehensive Cancer Network 1.2009 www.nccn.org
Risk categories (N0 M0) – Clinically localized

	Low	Intermediate	High	Very high, locally advanced
T	1-2a	2b, 2c	3a	3b, 4
PSA	< 10	10-20	>20	Any
Gleason score	< 7	7	>7	any

Metastatic:
any T, N1 M0
any T, any N, M1

Monotherapy (ABS, GEC-ESTRO)

1. T1 i T2,
2. N0,
3. M0,
4. PSA <10, Gleason ≤6,
5. > 5 years life expectancy

ELSEVIER

Int. J. Radiation Oncology Biol. Phys., Vol. 44, No. 4, pp. 789–799, 1999

0360-3016/99/$–see front matter

PII S0360-3016(99)00069-3

CLINICAL INVESTIGATION — Prostate

AMERICAN BRACHYTHERAPY SOCIETY (ABS) RECOMMENDATIONS FOR TRANSPERINEAL PERMANENT BRACHYTHERAPY OF PROSTATE CANCER

SUBIR NAG, M.D.,*† DAVID BEYER, M.D.,*‡ JAY FRIEDLAND, M.D.,*§ PETER GRIMM, D.O.,*‖ AND RAVINDER NATH, PH.D.*¶

*Prostate Brachytherapy Quality Assurance Group, Clinical Research Committee, American Brachytherapy Society, Reston, VA; †The Ohio State University, Columbus, OH; ‡Arizona Oncology Services, Phoenix, AZ; §Moffitt Cancer Center, Tampa, FL; ‖Swedish Medical Center, Seattle, WA; and ¶Yale University, New Haven, CT

Brachytherapy as a Boost to EBRT:

- T2b, T2c or
- Gleason 8-10 or
- PSA > 20 ng/ml

Other possible indications for Brachytherapy as a Boost to EBRT:

- Perineural invasion,
- Multiple positive biopsies, bilateral positive biopsies,
- MRI positive for capsular penetration.

Brachytherapy (including Boosting EBRT) in Conjunction with Androgen Deprivation:

- Patients with initially large prostate (>60 cc) that have downsized sufficiently

Doses:

I-125 monotherapy	140-160 Gy (144-145 Gy)
I-125 + 40-50 Gy EBRT	100-120 Gy
Pd-103 monotherapy	110-120 Gy (125 Gy)
Pd-103 + 50 Gy EBRT	60-90 Gy
Cs-131 monotherapy	115 Gy

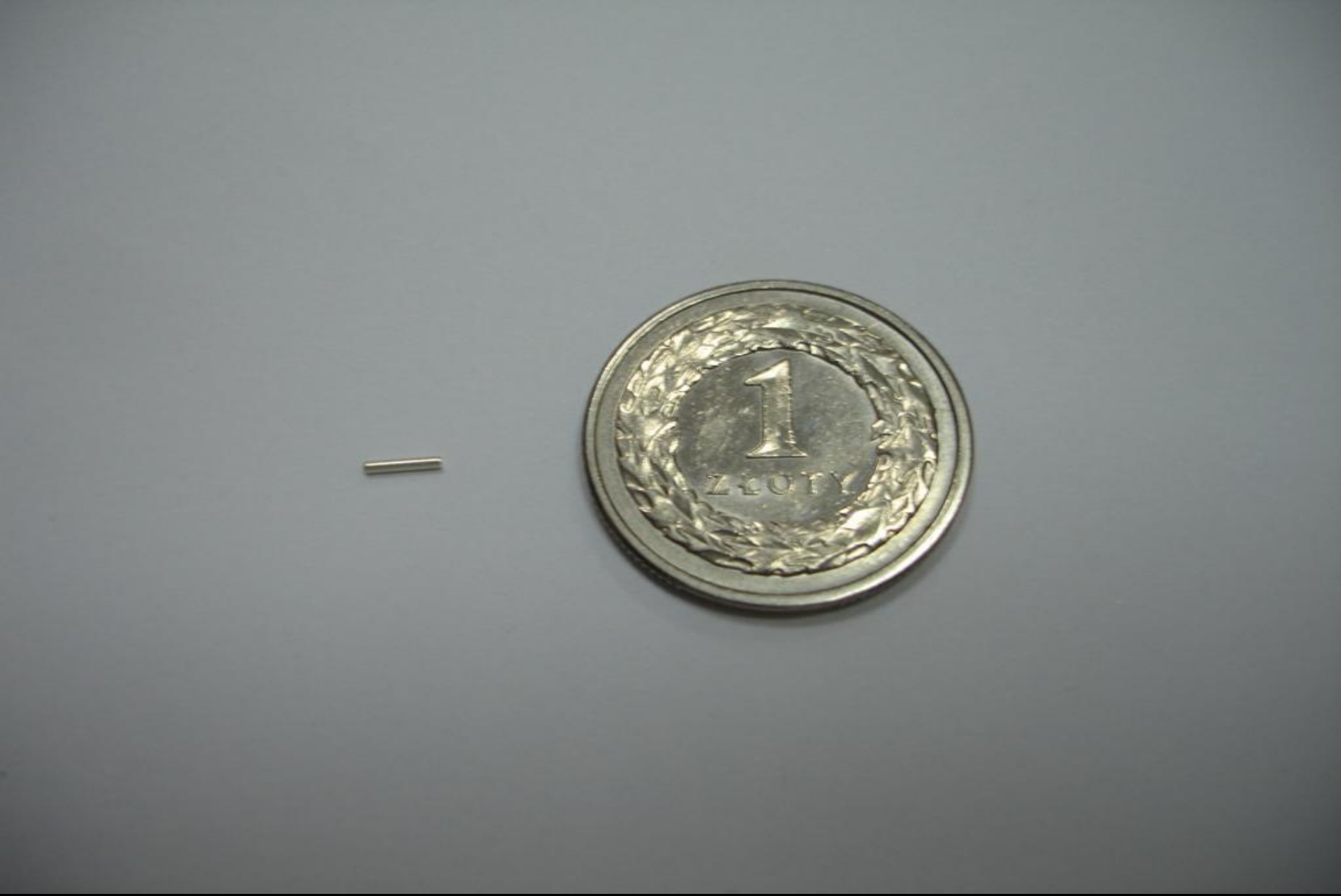
Contra-indications to permanent seed implants

ESTRO/EAU/EORTC RECOMMENDATIONS ON PERMANENT SEEDIMPLANTATION FOR LOCALISED PROSTATE CANCER

1. **Life expectancy less than 5 years.,**
2. **The presence of metastatic disease,**
3. **Recent transurethral resection of prostate (TURP) with persisting large prostatic defect,**

   it is often difficult to achieve a satisfactory seed distribution and these patients have a high risk of incontinence after brachytherapy.

4. **No bleeding disorder and patients on regular aspirin or anticoagulants should stop it at least seven days before implantation,**
5. **Patients with a prostate gland of greater than 50 cm3 have a high probability of pubic arch interference.**



Example of seed

IsoCord® Seeds from IBt-Bebig

Seeds types feature:

1. **excellent visibility in ultrasound imaging,**
2. **biocompatible Titanium housing,**
3. **wide activity range,**
4. **calibration according to National Institute of Standards and Technology (NIST),**
5. **full length X-ray marker for optimal identification in CT post planning,**
6. **full MRI compatibility.**

The physical and radiochemical properties are:

Isotope:	**^{125}I (Iodine)**
Radiochemical purity:	**> 99.9%**
Half Life of ^{125}I	**59.4 days**
Geometric measurements:	**Length: 4.5 mm**
Active length	**3.45 mm**
External diameter:	**0.8 mm**
Wall thickness of capsule material:	**0.05 mm**
Type of radiation:	**photons**
Energy of the photons:	**22 keV – 36 keV**

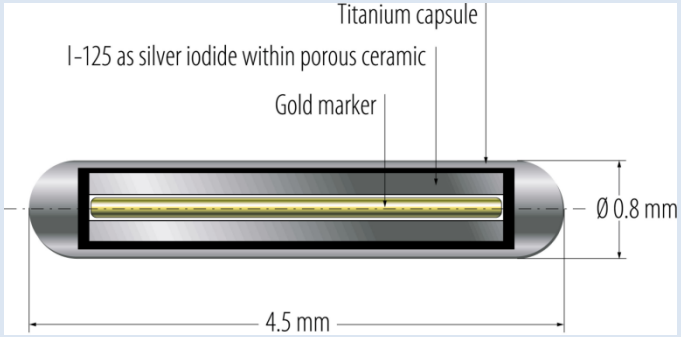
Mechanical and thermal tolerance limits:
Class C 63211 according to ISO 2919

- Low Morbidity ✓
- Cost Effective ✓
- Outpatient Procedure ✓
- One Day Procedure ✓

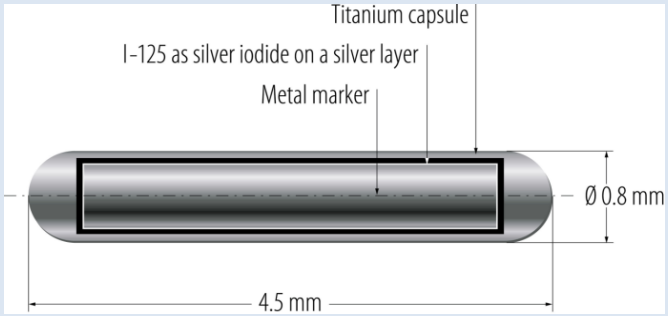
BEBIG IsoSeed®

2 seed types

I25.S06

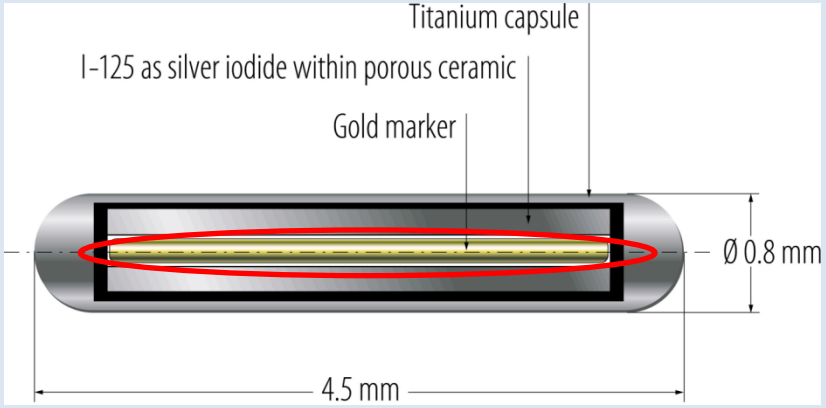


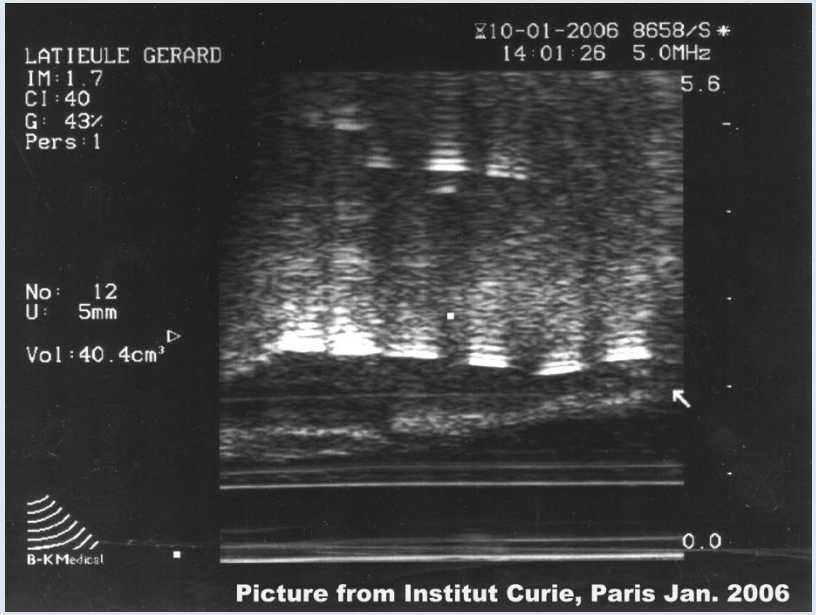
I25.S17



BEBIG IsoSeed®

I25.S06

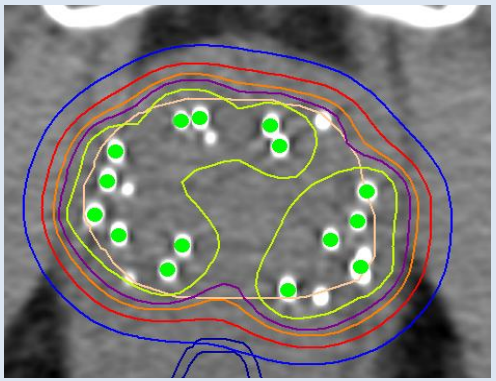




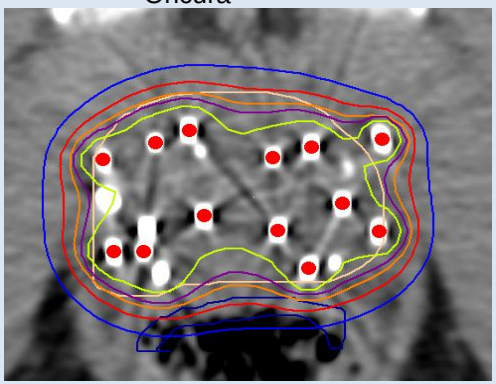
The use of a thin gold wire inside a porous ceramic as the activity carrier has advantages over a thick silver marker onto which the active I-125 is chemically bound:

- **excellent ultrasound visibility,**
- **full length gold x-ray marker,**
- **the thin gold wire and ceramic cause less absorption, leading to a seed with a better anisotropy and higher dose rate constant,**
- **the use of the thin gold wire and ceramic leads to higher quality CT images with fewer artefacts**

I25.S06

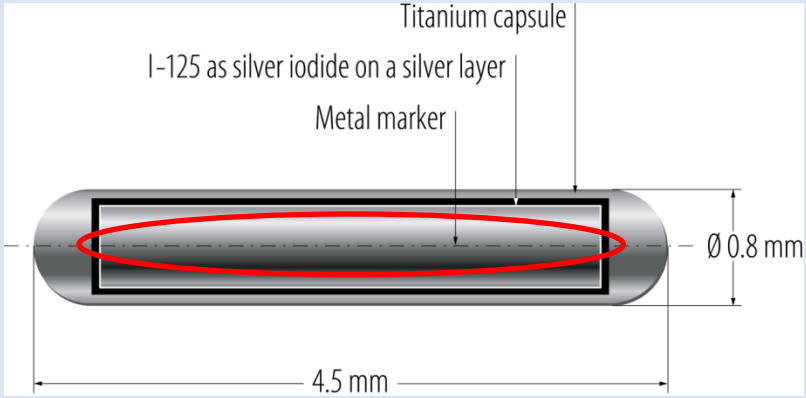


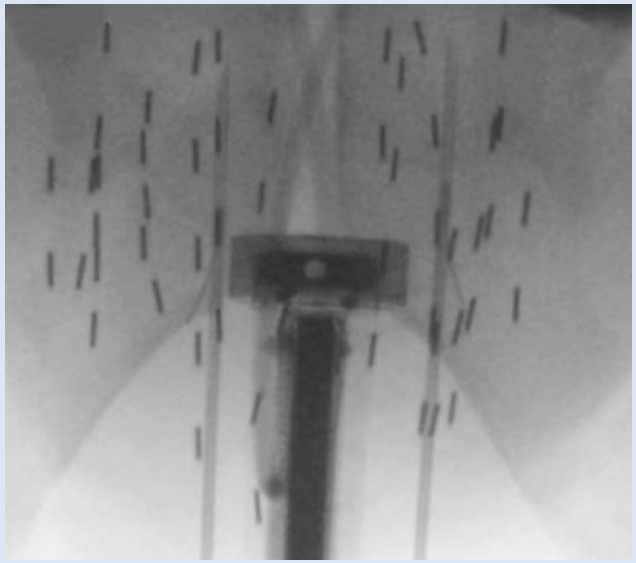
Competitor
Oncura



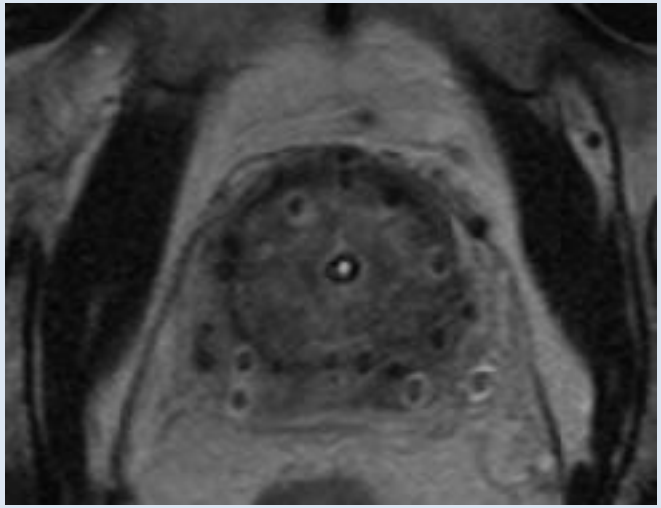
BEBIG IsoSeed®

I25.S17



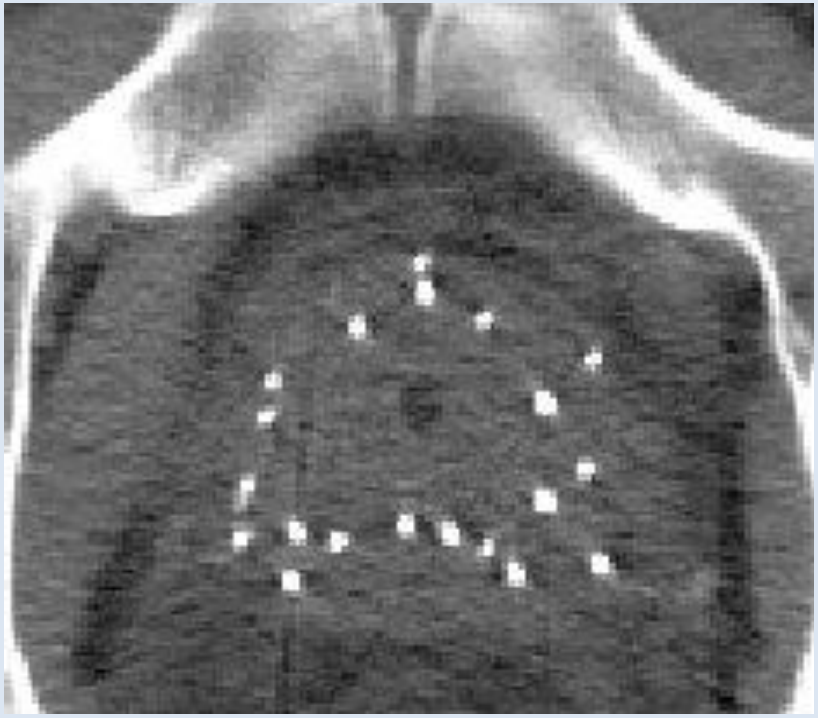


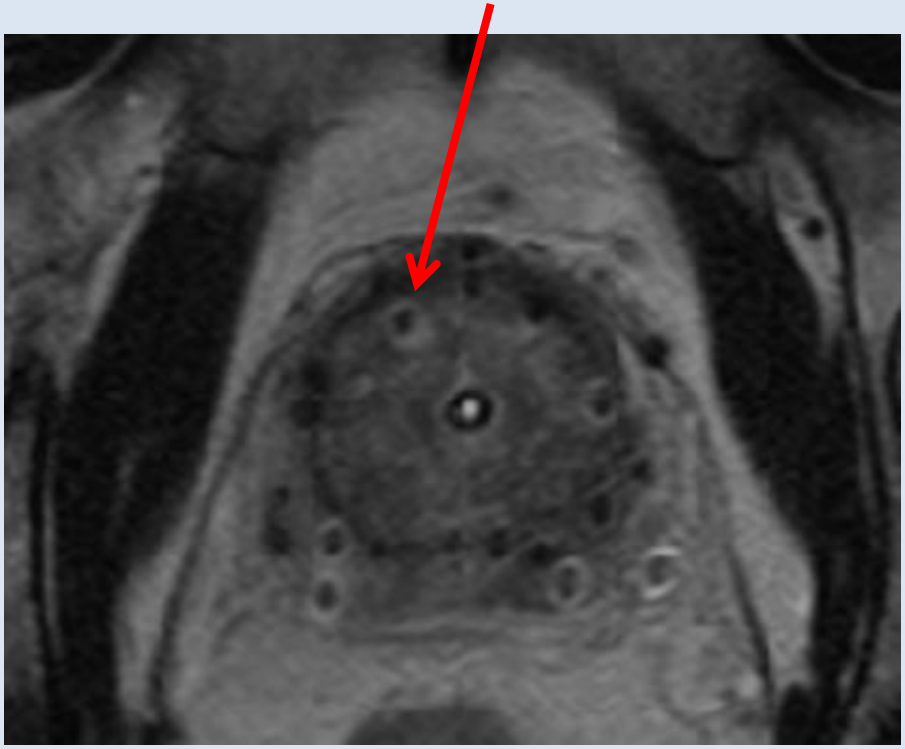
- **excellent ultrasound visibility**
- **full length metal x-ray marker**
- **good fluoroscopic image**
- **interesting for MRI**



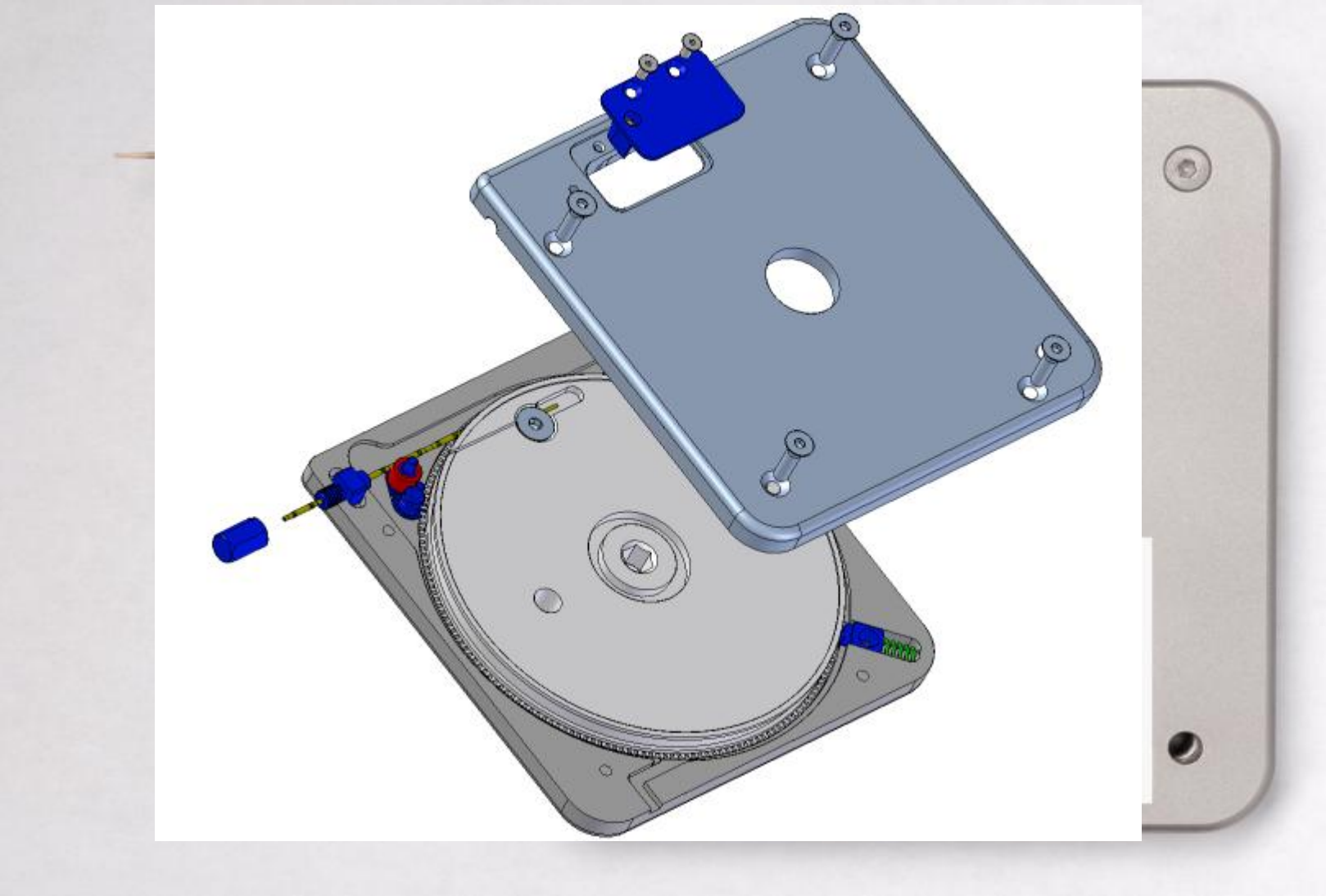
In CT imaging the high contrasts leads to absorption artefacts which can be handled using a soft tissue filter for image reconstruction on the CT device.

I25.S17 seeds also provide a unique quality in MRI imaging. While normal seeds only appear as dark dots in the image, similar to a blood vessel, S17 seeds show a bright halo around the dark dot, this allows you to clearly identify the seeds.



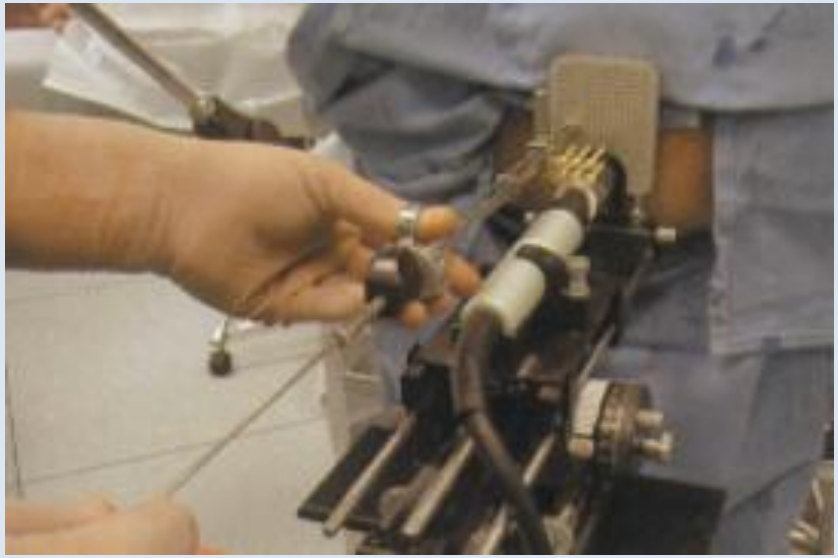


IsoCord Cartridge



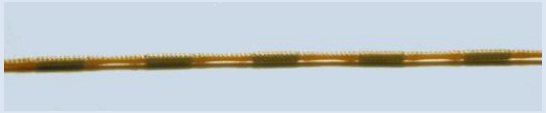
Implanting the Implants

Loose

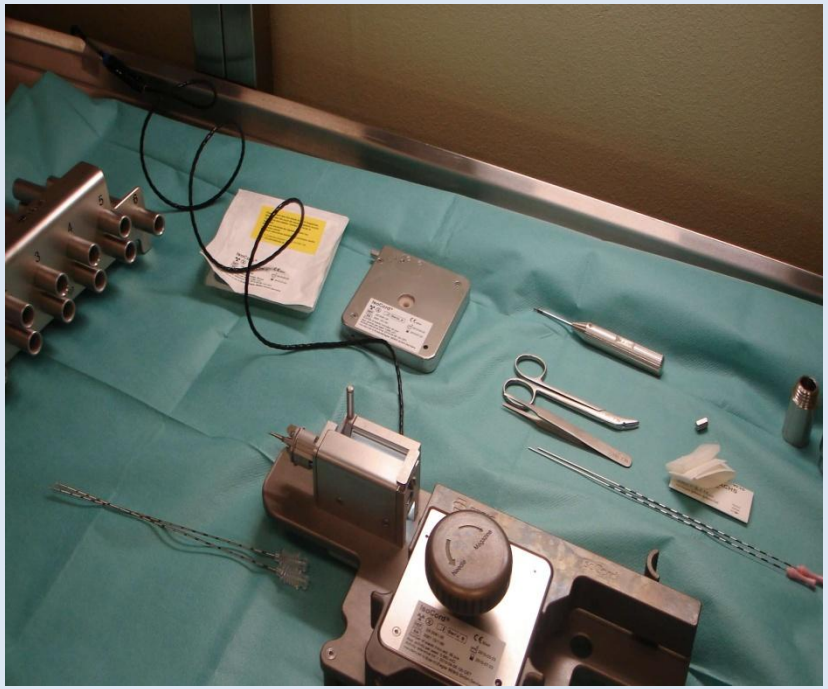


- implant *empty* needles
- seeds implanted individually using the Mick Applicator

Strand

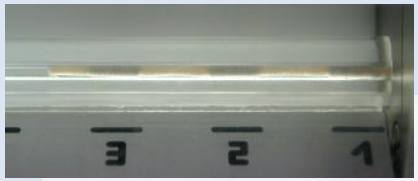


- implant *preloaded* needles
- seeds are implanted in the form of a strand: IsoCord

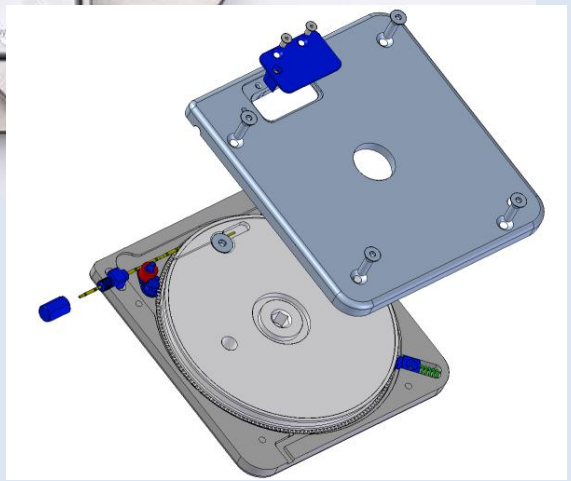


Needle Loading Station (NLS)

- clearly see the strand before cutting

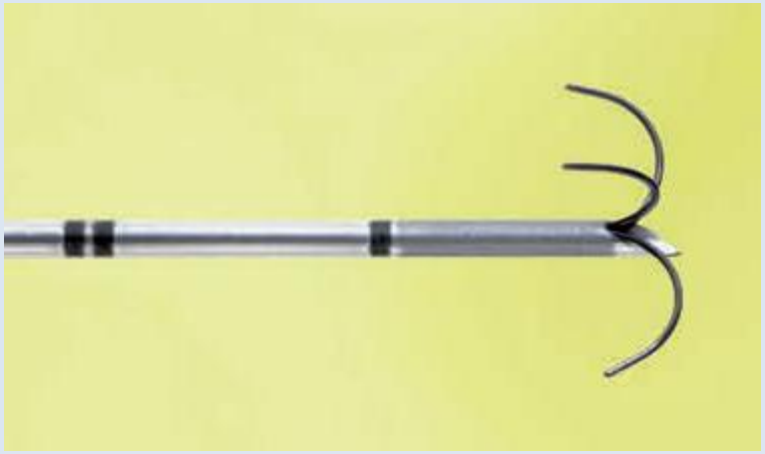


Needle loaded with strand
of desired length
WITHOUT
being exposed to radiation



- container for the IsoCord
- can hold up to 75 seeds

Accessories: Needles (Pajunk)



Fixationskanüle DeltaFix

Seeding-Kanüle DeltaSeed

Accessories: Needle Rack

- **offers the perfect storage solution for needles loaded in advance**


BEBIG
1
2
3
4
5
21 11:13

Accessories: Transfer Tube

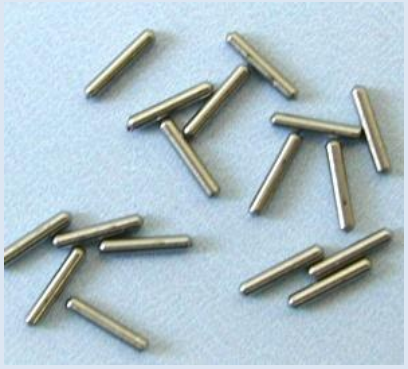
Optimize coverage of base and apex:

1. **place short strand at base and apex (along the same track)**

Easy using

1. **place first strand as usual**
2. **position needle for second implant**
3. **reload using IsoCord Transfer Tube**

IsoCord: Composition



IsoSeed seeds

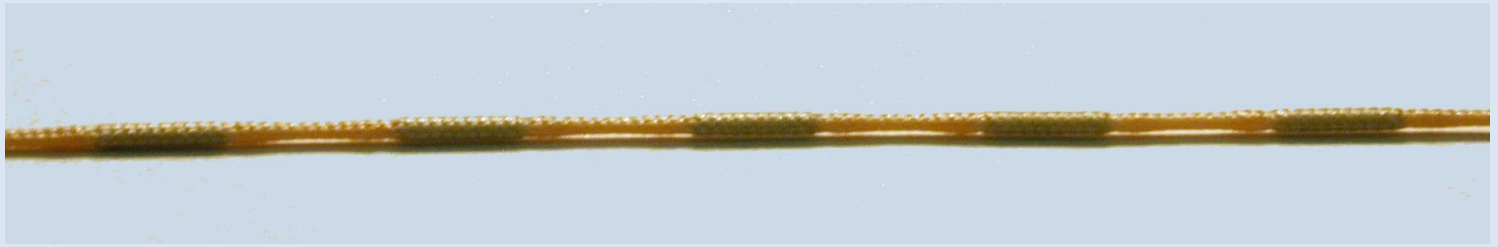
+

IsoCord spacers

+

Vicryl suture

=



IsoCord

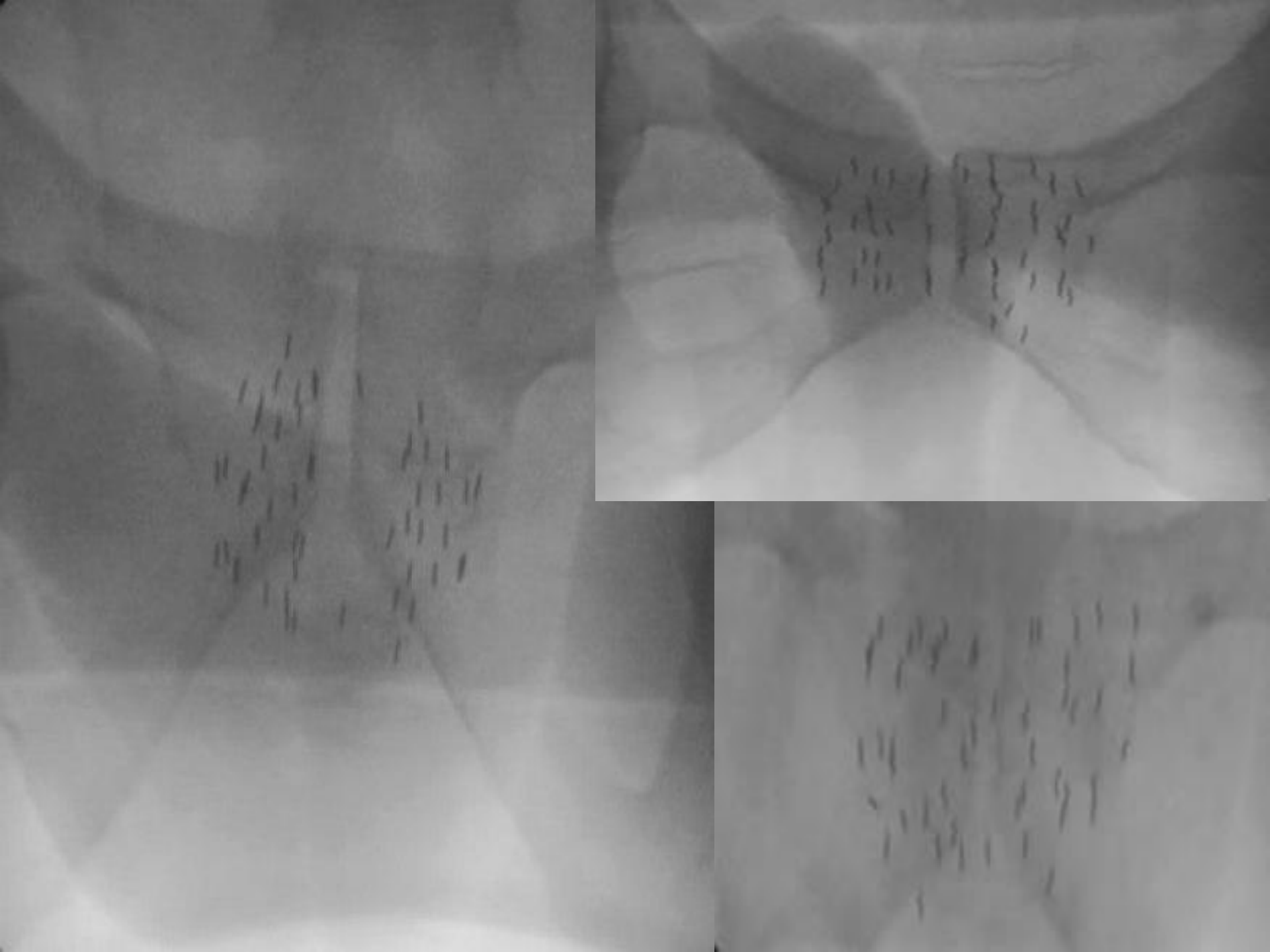
Ultrasound Device

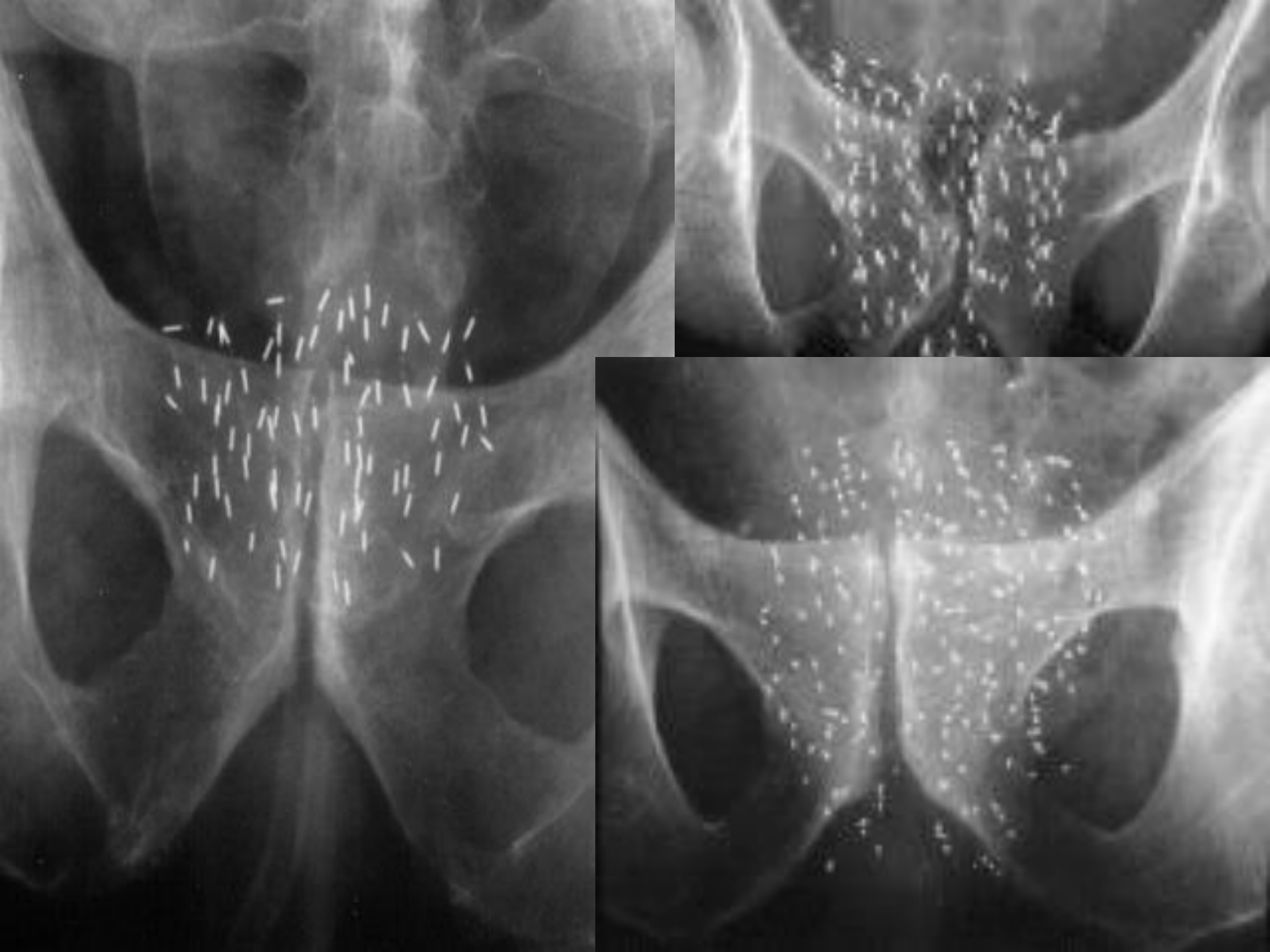
e.g. B&K ProFocus

Interface with different planning system: VariSeed 8 (Varian), First (Nucletron), others…

Iodine 125
Half-Life 59,41 days

Activity Class	Apparent Activity in mCi								
	min	max	mean	mean					
	on reference date			+ 1 day	+ 2 days	+ 3 days	+ 4 days	+ 5 days	+ 6 days
1	0,281	0,304	**0,293**	0,289	0,286	0,282	0,279	0,276	0,273
2	0,305	0,330	**0,318**	0,314	0,310	0,307	0,303	0,300	0,296
3	0,331	0,358	**0,345**	0,341	0,337	0,333	0,329	0,325	0,321
4	0,359	0,388	**0,374**	0,369	0,365	0,361	0,356	0,352	0,348
5	0,389	0,421	**0,405**	0,400	0,396	0,391	0,387	0,382	0,378
6	0,422	0,457	**0,440**	0,434	0,429	0,424	0,419	0,415	0,410
7	0,458	0,496	**0,477**	0,471	0,466	0,461	0,455	0,450	0,445
8	0,497	0,539	**0,518**	0,512	0,506	0,500	0,494	0,489	0,483
9	0,540	0,584	**0,562**	0,555	0,549	0,543	0,536	0,530	0,524
10	0,585	0,634	**0,610**	0,602	0,595	0,589	0,582	0,575	0,568
11	0,635	0,688	**0,662**	0,654	0,646	0,639	0,631	0,624	0,617
12	0,689	0,747	**0,718**	0,710	0,701	0,693	0,685	0,677	0,669
13	0,748	0,811	**0,780**	0,770	0,762	0,753	0,744	0,735	0,727
14	0,812	0,880	**0,846**	0,836	0,826	0,817	0,807	0,798	0,789
decay factor			1,000	0,988	0,977	0,966	0,954	0,943	0,932
day of the week			Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday





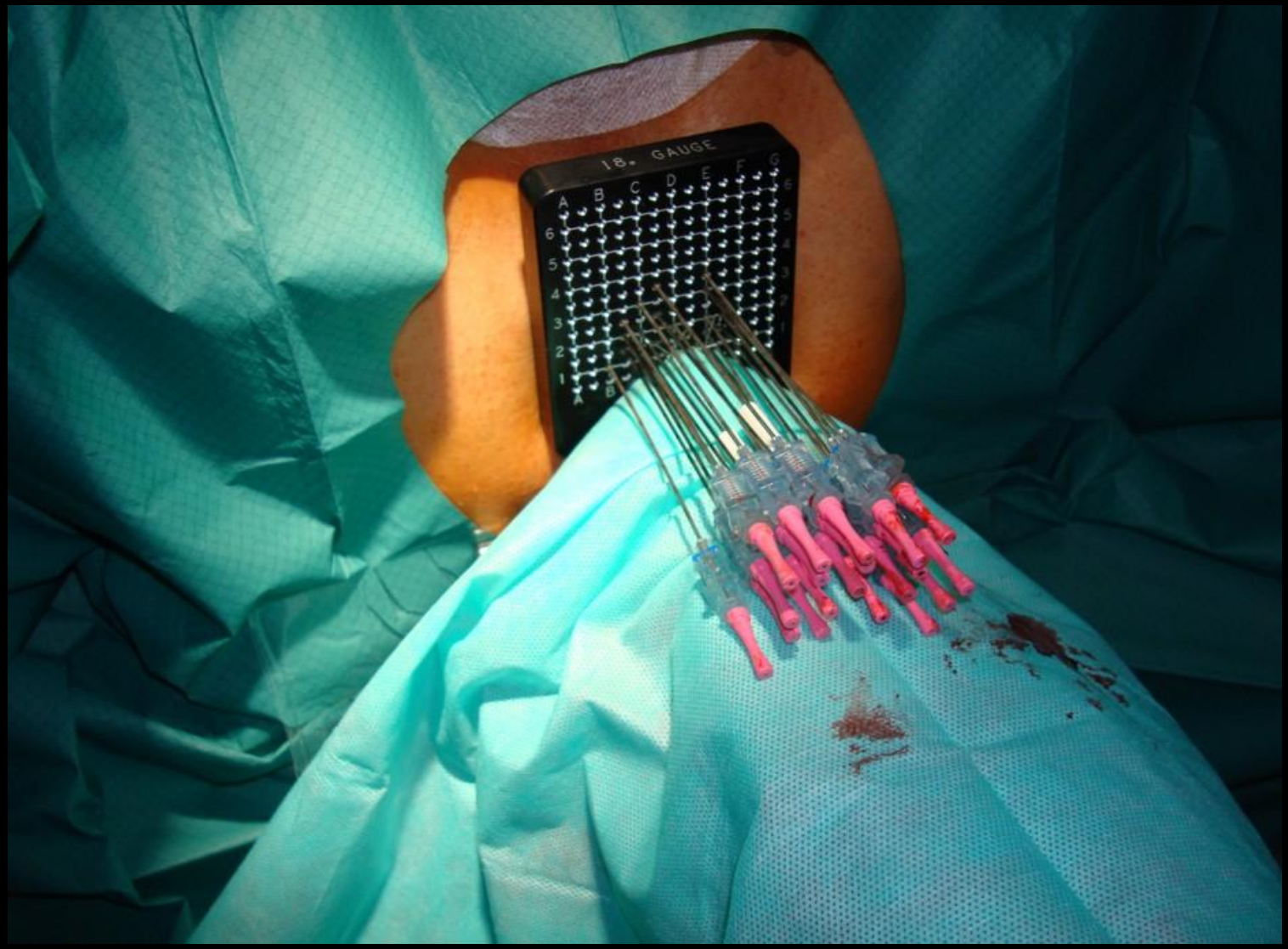
Post implant dosimetry

It is usual to perform the CT scan 4±6 weeks after implantation when oedema has settled.

It is recommended that the following indices are recorded for all patients:

1. **The volume implanted.**
2. **The number of seeds.**
3. **The number of needles used.**
4. **The total activity implanted.**
5. **The prescribed dose.**
6. **The D90, that is the dose that covers 90% of the prostate volume as defined from post implant imaging.**
7. **The V100, that is the percentage of the prostate volume that has received the prescribed dose.**
8. **V150, the volume that has received 50% more than the prescribed dose.**

Utrecht technique – used in 2008-2009



Advantages

1. Similar clinical results to surgery and EBRT - short, convenient treatment for the patient,

2. the treatment of minimal invasiveness - spinal anesthesia or general, it takes 1 - 2 h, the patient leaves the hospital the next day usually (short-term hospitalization: 1 - 2 days), return to daily activities within a few days,

3. high, effective dose of radiation,

4. higher concentration of the dose within the prostate which affects the reduction in the risk of complications in OaRs,

5. reduction in the frequency of complications: impotence (5-15%), urinary incontinence (<5%).

Disadvantages

Greater Poland Cancer Centre

18.12.2008 – 19.01.2011

57 patients (50 – 82 years)

43 – Rapid Strands (USA); 14 – BEBIG (Germany)

Age:

50 – 59	**17**
60 – 69	**28**
70 – 79	**10**
≥ 80	**2**

Median: 63.8 years

55 patients – monotherapy

2 patients – recurrence after EBRT

T1 – 32

T2 – 25

Gleason:

≤ 6 – 45

7 – 12

PSA: median 9.2 ng/ml

< 10 ng/ml - 44

> 10 ng/ml - 13

Median seeds number - 53

Range: 30 – 82

21 patients – 40 - 50

18 patients – 51 - 60

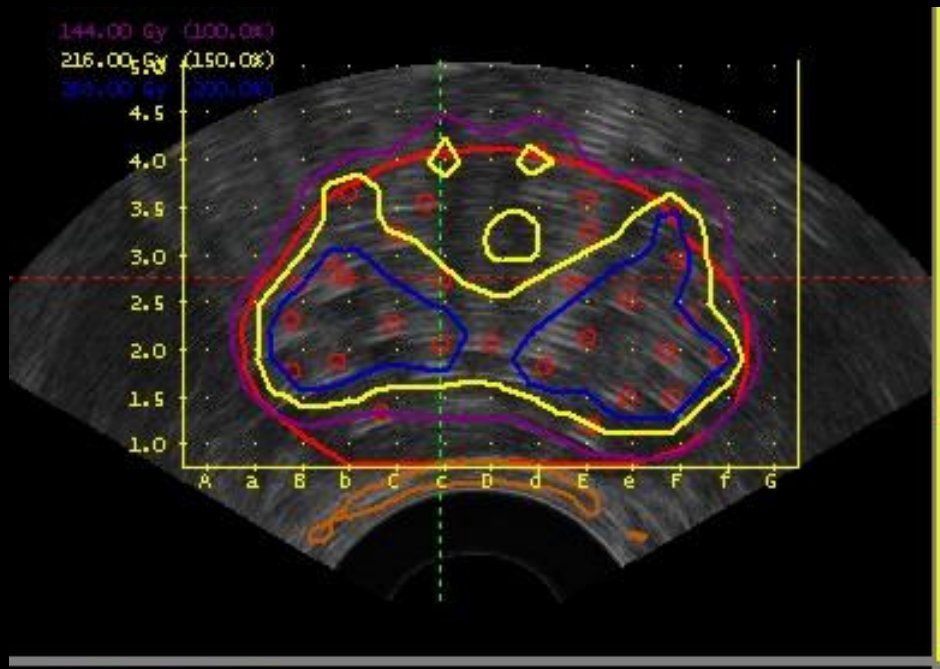
Median needles number: 23

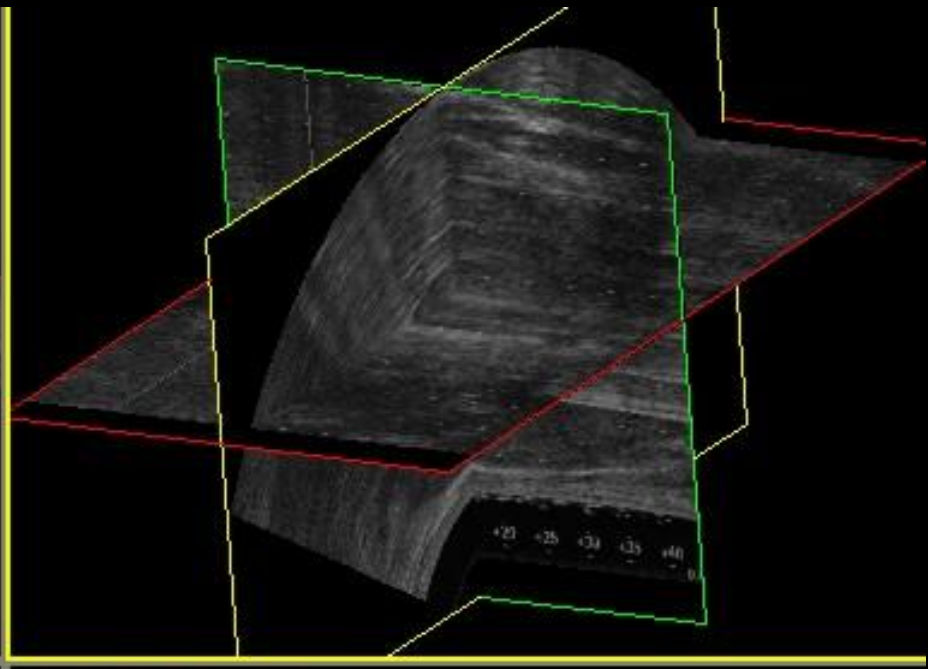
Range: 15 – 34

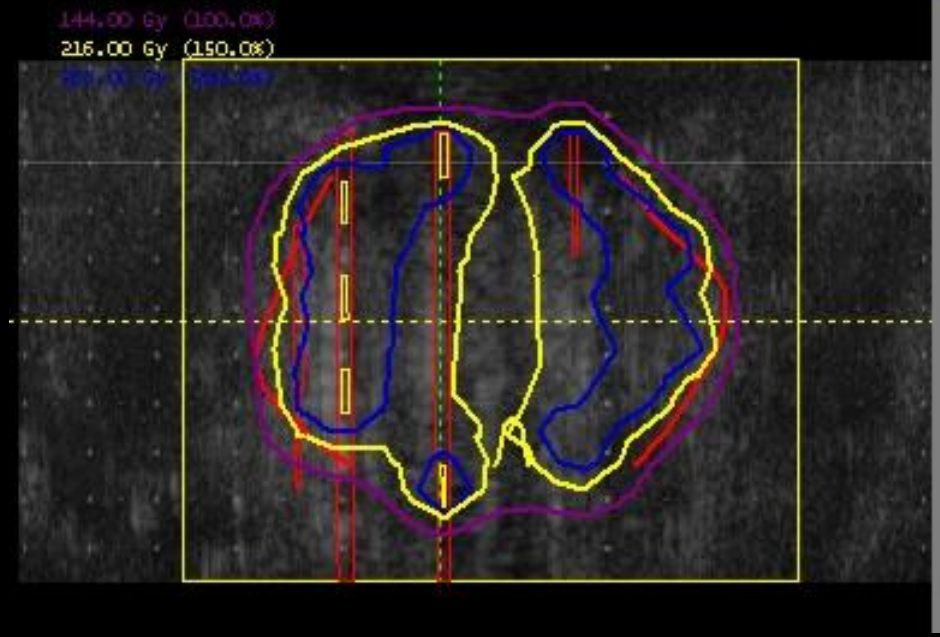
Median prostate volume: 32.5 cm3

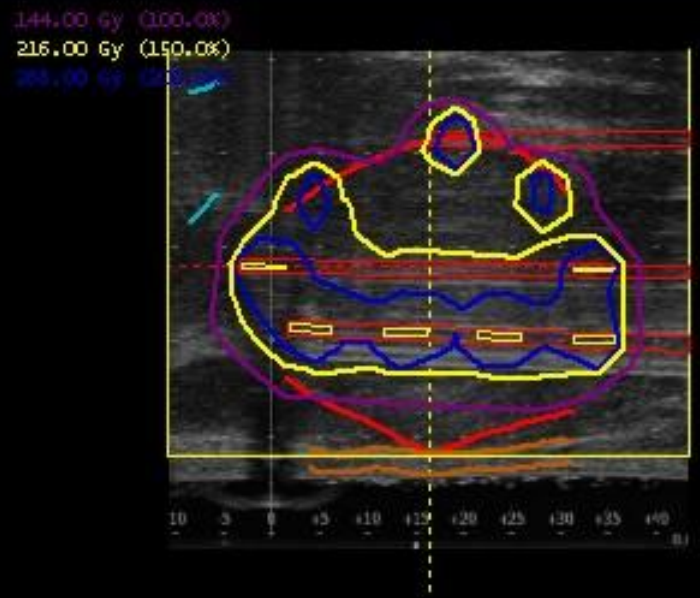
Range: 14 – 62 cm3

Severe complications: 1 patients – urinary retention


144.00 Gy (100.0%)
216.00 Gy (150.0%)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
A a B b C c D d E e F f G




144.00 Gy (100.0%)
216.00 Gy (150.0%)


144.00 Gy (100.0%)
216.00 Gy (150.0%)

Thank you for your attention