SIMPOSIO
IMAGE GUIDED IN BRACHYTHERAPY

Dott. Marcello Mignogna
S.C. Radioterapia Oncologica Lucca

la letteratura

Radiotherapy and Oncology 100 (2011) 333–343

Contents lists available at SciVerse ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

Special commentary

Image guided, adaptive, accelerated, high dose brachytherapy as model for advanced small volume radiotherapy

Christine Haie-Meder [a], Frank-André Siebert [b], Richard Pötter [c,*]

2011

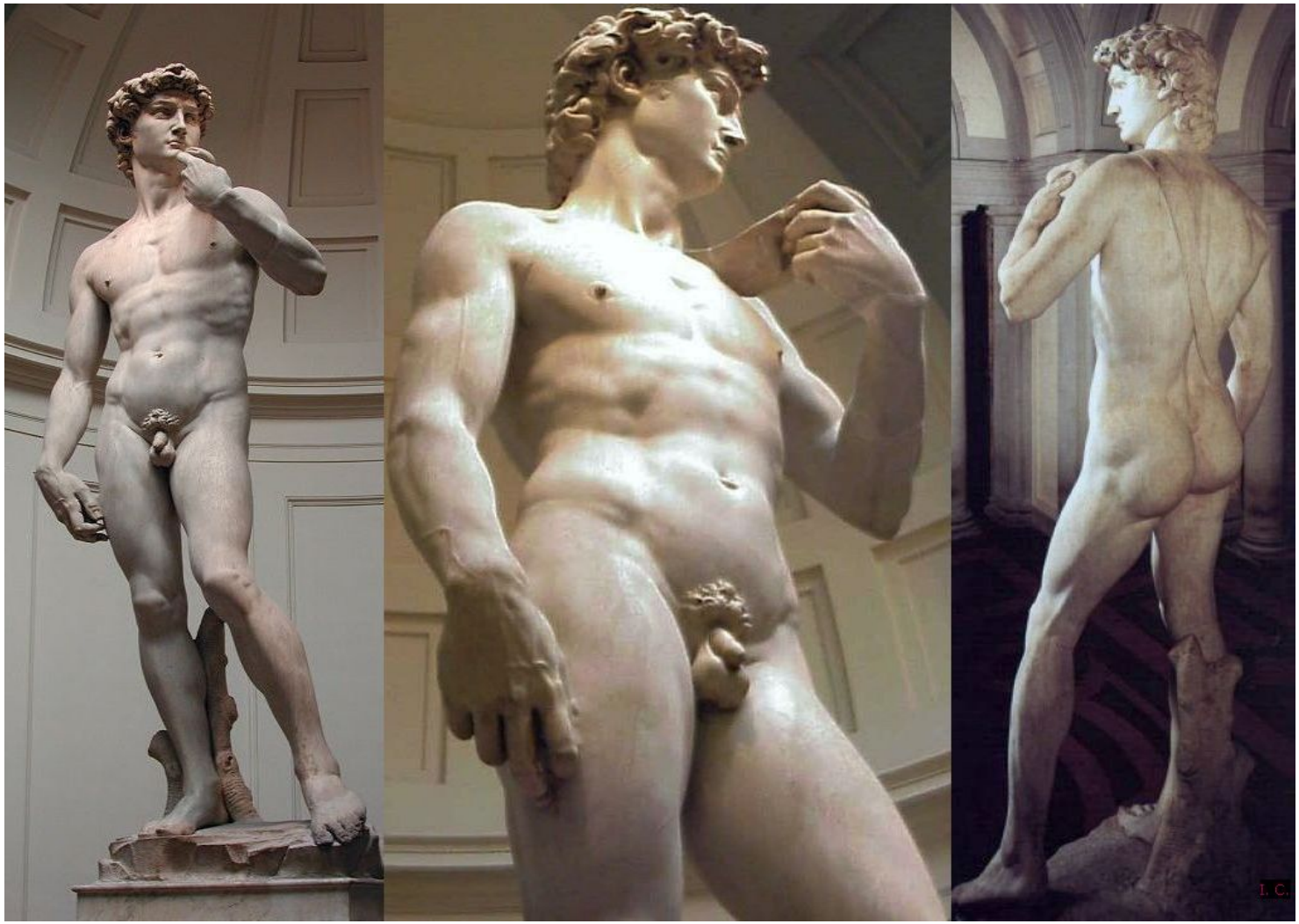
[a] Department of Radiotherapy, Institut Gustave-Roussy, Villejuif, France; [b] Department of Radiotherapy, University Clinic of Schleswig-Holstein, Kiel, Germany; [c] Department of Radiotherapy, Medical University of Vienna, Austria

PUB MED LISTS Keyword "Brachytherapy"		
anno	N° articoli	factor
1980	148	
1990	348	2.6
2000	685	1.8
2010	895	1.3

Prostate image (US) guided brachytherapy		
anni	N° articoli	factor
1990/2000		17
2000/2009		1.4
2010	309	

Probate Group Gec-ESTRO Alfredo Polo: Systematic Review
214 art.: 155 original articles, 40 technical, 10 review, 9 case report

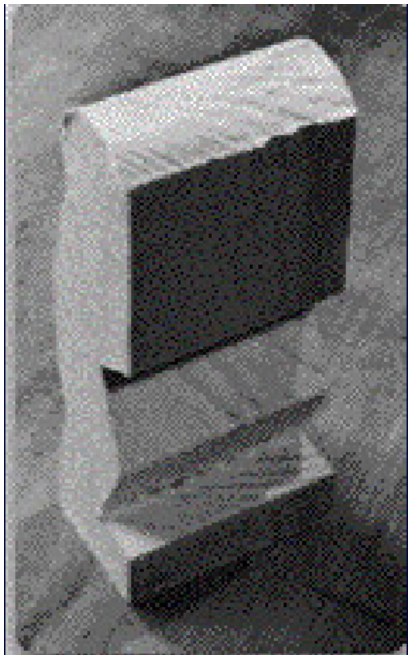
Una dipinto a 360°

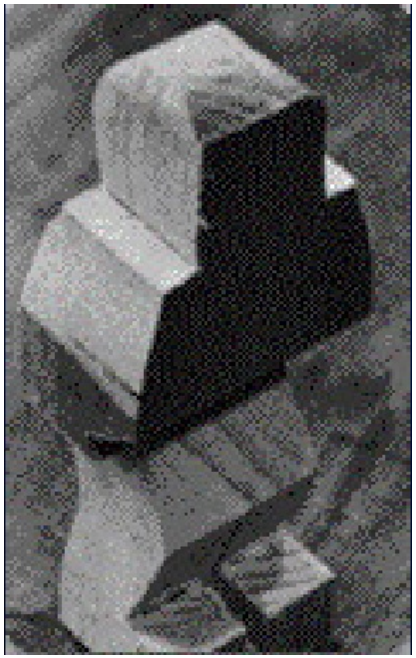


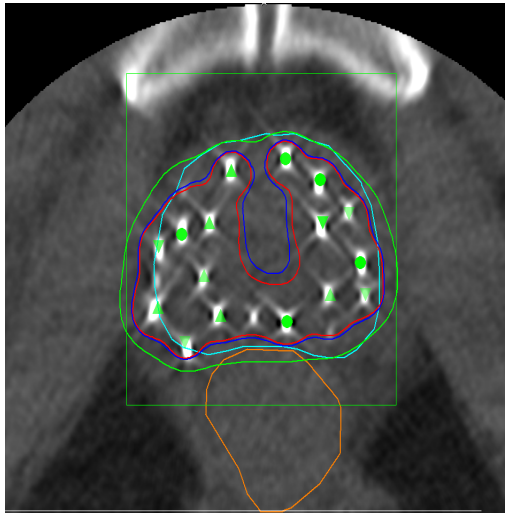
Sviluppo tecnologico in Radioterapia

Ling CC et al Int J Radiat Oncol Biol Phys 2000

2D planning → 3D conformal → IMRT-IGRT → BCT ecoguidata real-time





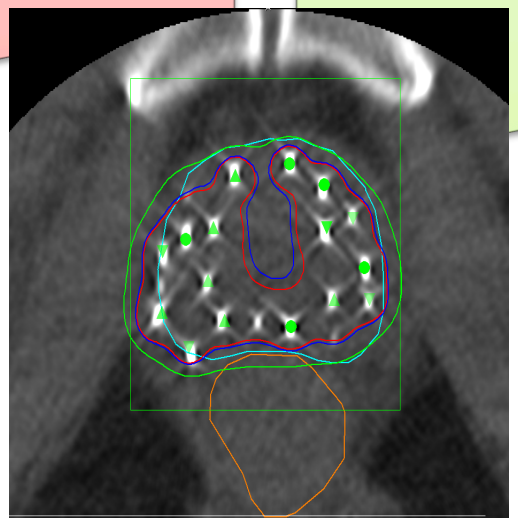


Nota: crescente risparmio di tessuti sani circostanti

Paradigma fondamentale della radioterapia

la più elevata dose possibile al tumore

Il massimo risparmio dei tessuti sani



Cosa si aspettano da noi questi pazienti

- risultato in termini di controllo di malattia
- un rapido ritorno alla vita lavorativa
- bassa tossicità acuta e tardiva
- preservazione della performance sessuale
- tempi di procedura breve

…inizierò questa mia presentazione …dalla fine

Cancer Radiother. 2013 Apr;17(2):111-7. doi: 10.1016/j.canrad.2013.01.009. Epub 2013 Mar 9.

Permanent implant prostate cancer brachytherapy: 2013 state-of-the art

[Article in French]

Cosset JM, Hannoun-Lévi JM, Peiffert D, Delannes M, Pommier P, Pierrat N, Nickers P, Thomas L, Chauveinc L.

Source

Département d'oncologie/radiothérapie, institut Curie, 26, rue d'Ulm, 75005 Paris, France. jean-marc.cosset@curie.net

CANCER RADIOTHER 2013

… The main point here is the ability to perfectly master the procedure and to comply with the dosimetric constraints, which have been recently redefined by the international societies, such as the GEC-ESTRO group. Mid- and long-term results, which are now available in the literature, indicate relapse-free survival rates of about 90% at 5-10 years, the best results being obtained with satisfactory dosimetric data.

…Il punto principale è la capacità di padroneggiare perfettamente la procedura d'impianto ….

Systematic review

Radiotherapy and Oncology 94 (2010) 12–23

Review of intraoperative imaging and planning techniques in permanent seed prostate brachytherapy

Alfredo Polo [a], Carl Salembier [b], Jack Venselaar [c],
Peter Hoskin [d,*], on behalf of the PROBATE group of the GEC ESTRO

2010

In a survey of the different treatments of prostate cancer, each of the three major therapies accounted for one third of the treated patients in a University Hospital

Goharderakhshan RZ
Urology 2000

The reasons for this rise in popularity includes the developments in transrectal ultrasound guidance, computer-based dose planning provided; reproducibility of the technique, with precise and predictable seed placement; low patient morbidity; and favourable long-term prostate-specific antigen (PSA) outcomes

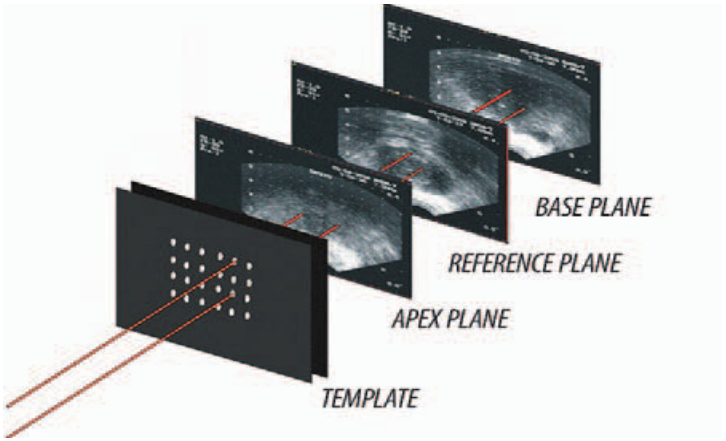
Hinnen KA
Int J Radiat Oncol Biol Phys 2009

with the convenience of a single-day outpatient procedure

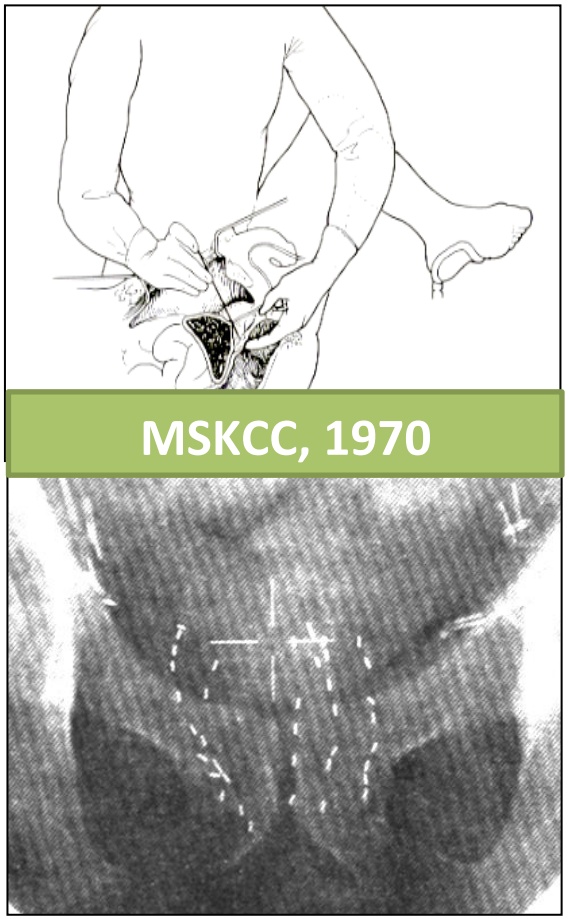
Shagal A
Nat Clin Pract Urol 2007

Preplanning ⇒ *Intraoperative planning* ⇒ *Interactive planning*
REAL TIME
Dynamic dose calculation

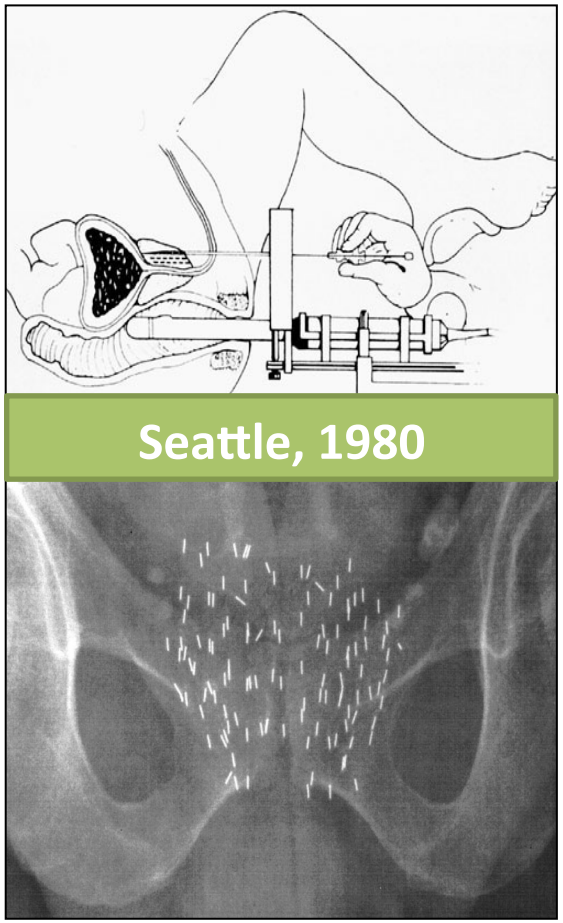
Evoluzione storica



Periodo pioneristico



MSKCC, 1970



Seattle, 1980

Radiotherapy and Oncology 94 (2010) 12–23

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Systematic review

Review of intraoperative imaging and planning techniques in permanent seed prostate brachytherapy

2010

Alfredo Polo [a], Carl Salembier [b], Jack Venselaar [c], Peter Hoskin [d,*], on behalf of the PROBATE group of the GEC ESTRO

[a] Ramon y Cajal University Hospital, Madrid, Spain; [b] Department of Radiation Oncology, Europe Hospitals, Brussels, Belgium; [c] Department of Radiotherapy, Dr B. Verbeeten Institute, Tilburg, The Netherlands; [d] Mount Vernon Cancer Centre, Northwood, UK

Ricaduta clinica dell'image guided

Trus image guided

Preplanning

Intraoperative planning

Interactive

Real Time

Dynamic dose calculation

Definizioni

American Brachytherapy Society

- **Preplanning**

si riferisce ad una procedura in due tempi: acquisizione di immagini TRUS in posizione di trattamento alcuni gg o sett. prima del trattamento, successiva nuova acquisizione in sala operatoria con macth di immagini e pianificazione

- **Planning intraoperatorio**

si riferisce alla creazione di un piano direttamente in sala operatoria subito prima della procedura d'impianto con l'immediata esecuzione dell'impianto pianificato

- **Planning interattivo**

si riferisce ad una ottimizzazione intraoperatoria del piano di trattamento usando un calcolo della dose basato su un feedback della posizione degli aghi sull'immagine

- **Calcolo dinamico della dose**

Int. J. Radiation Oncology Biol. Phys., Vol. 55, No. 4, pp. 956–963, 2003

10 anni dopo

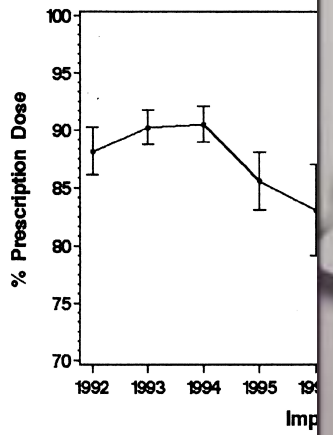
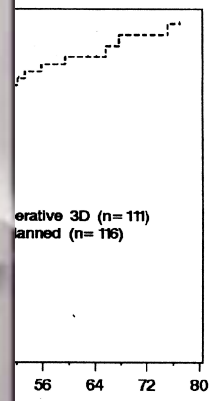


Fig. 1. V_{100} expressed as a perc
time. Significant improvement of
1997 with the introduction of the intraoperative conformal technique.

observed in 1997 with the introduction of the intraoperative conformal technique.



2 urinary symptoms
he I-3D and PP techniques, respectively.

Planning

intraoperatorio, interattivo, …real-time

Shah JN 2006

SOLO ALCUNI DATI

Gewanter RM 2000

Confronto preplanning e intraoperative planning				
autore	time	D90	V100	p
Wilkinson	-	120/136 Gy	76/84%	<0.001
Matzkin	205/100	53%-114%	58/95%	<0.001
Shah	-	75/90%		

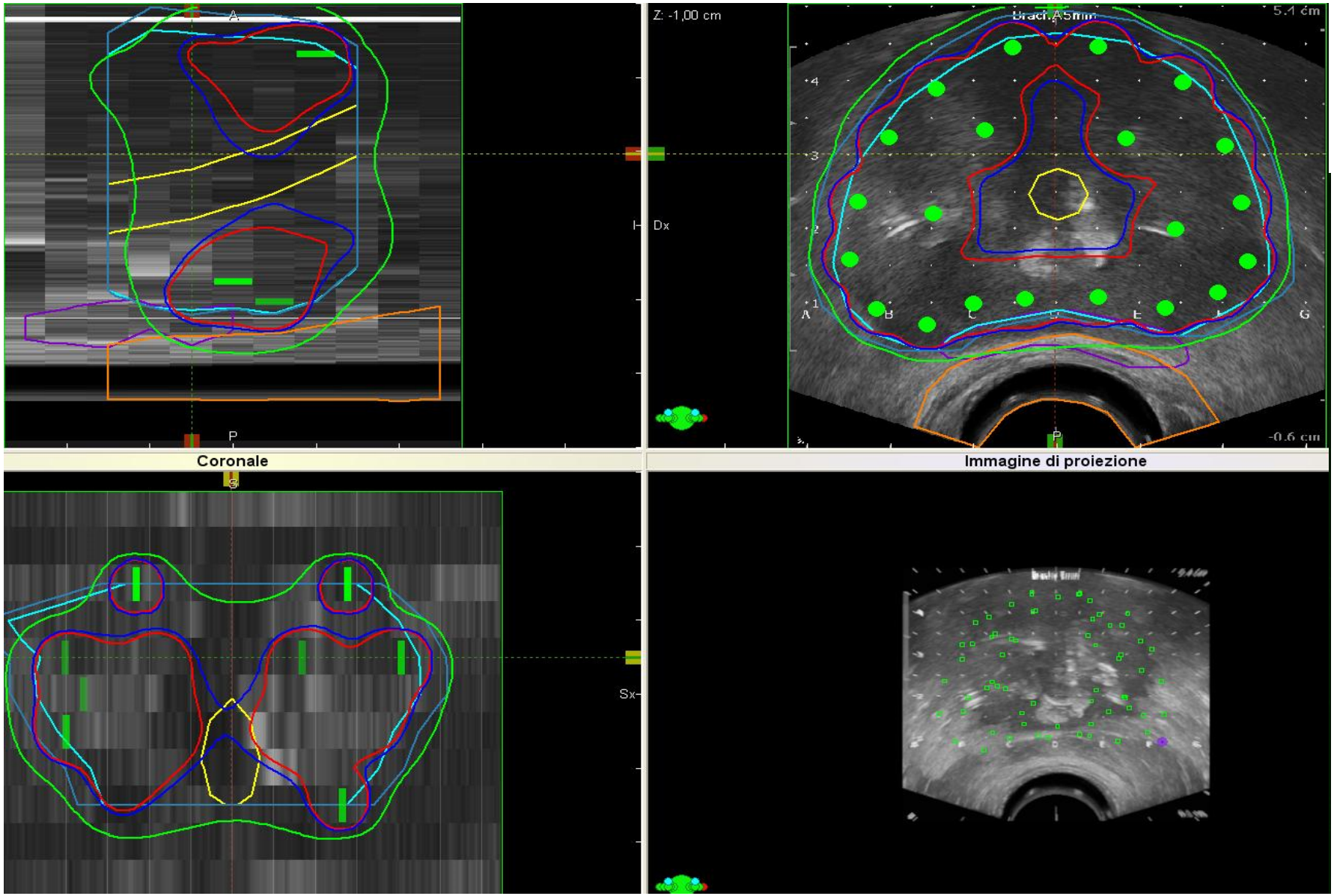
Woolsey J 2004

Matzkin H 2003

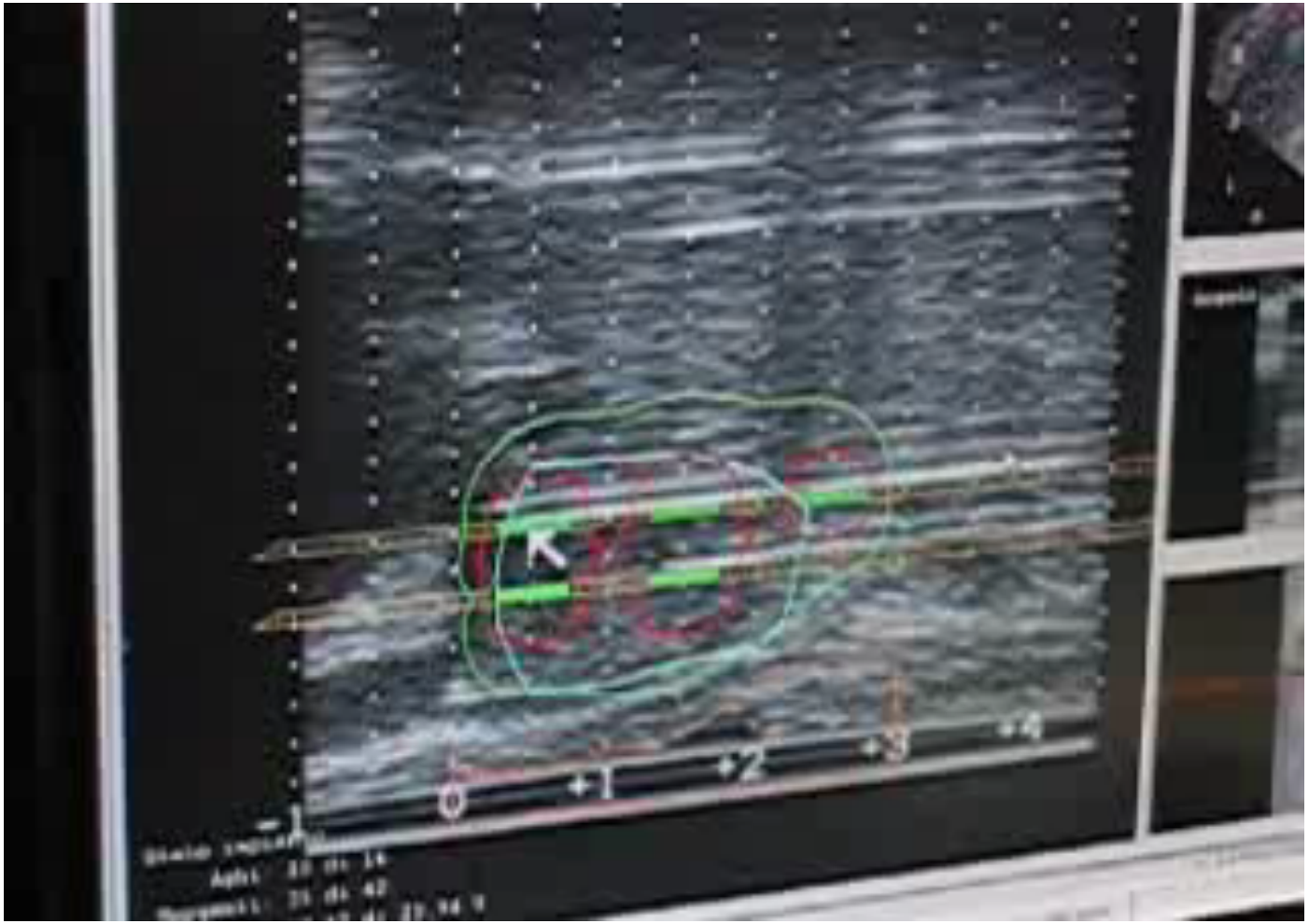
…ma per fare questo ci vuole un buon lavoro di squadra..

Su più piani

PD 145 Gy



Impianto in real-time



Analisi di settore

Analisi dei settori

Configurazione settori

Struttura primaria: ☑ Abilita settori

Prostata

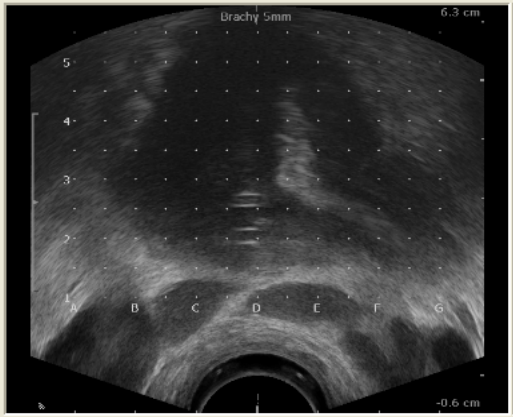
Centri di settori:

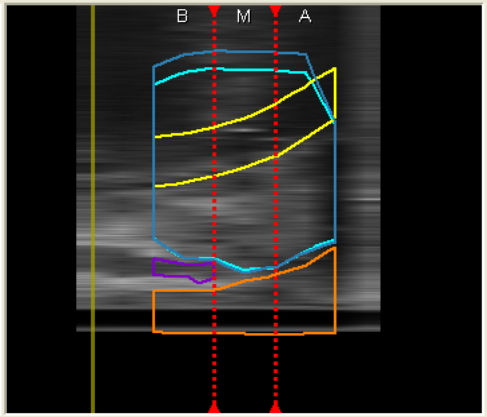
Centro di proiezione

Struttura con margine: ☐ Abilita margini

Trasversale: Sagittale:

Diagramma dei settori





Base

Posizione

Apice

Parametri qualità dosimetrica

Insieme parametri: lucca | Salva | Elimina | ☑ Celle di tabella colori | ☑ Mostra settori | ☐ Mostra margini

		Settori											
		1	2	3	4	5	6	7	8	9	10	11	12
Classificazione Gleason													
Volume totale	Settori	2,40cc	3,37cc	1,73cc	3,16cc	2,72cc	4,19cc	2,52cc	4,27cc	2,18cc	3,52cc	1,92cc	3,51cc
V200%	Settori	0,20cc	0,77cc	0,07cc	0,72cc	0,25cc	1,24cc	0,68cc	2,29cc	0,24cc	0,92cc	0,59cc	1,93cc
V150%	Settori	0,87cc	2,47cc	0,26cc	1,87cc	1,51cc	3,51cc	1,71cc	3,84cc	1,17cc	2,71cc	1,52cc	3,26cc
V100%	Settori	2,27cc	3,36cc	1,50cc	3,15cc	2,72cc	4,19cc	2,52cc	4,27cc	2,18cc	3,52cc	1,92cc	3,51cc
V100%	Settori	94,70%	99,56%	86,83%	99,90%	100,00%	99,96%	99,68%	100,00%	100,00%	99,97%	100,00%	100,00%
D90%	Settori	151,97Gy	191,74Gy	139,60Gy	180,33Gy	201,39Gy	205,49Gy	175,55Gy	216,92Gy	193,12Gy	193,51Gy	197,61Gy	227,33Gy

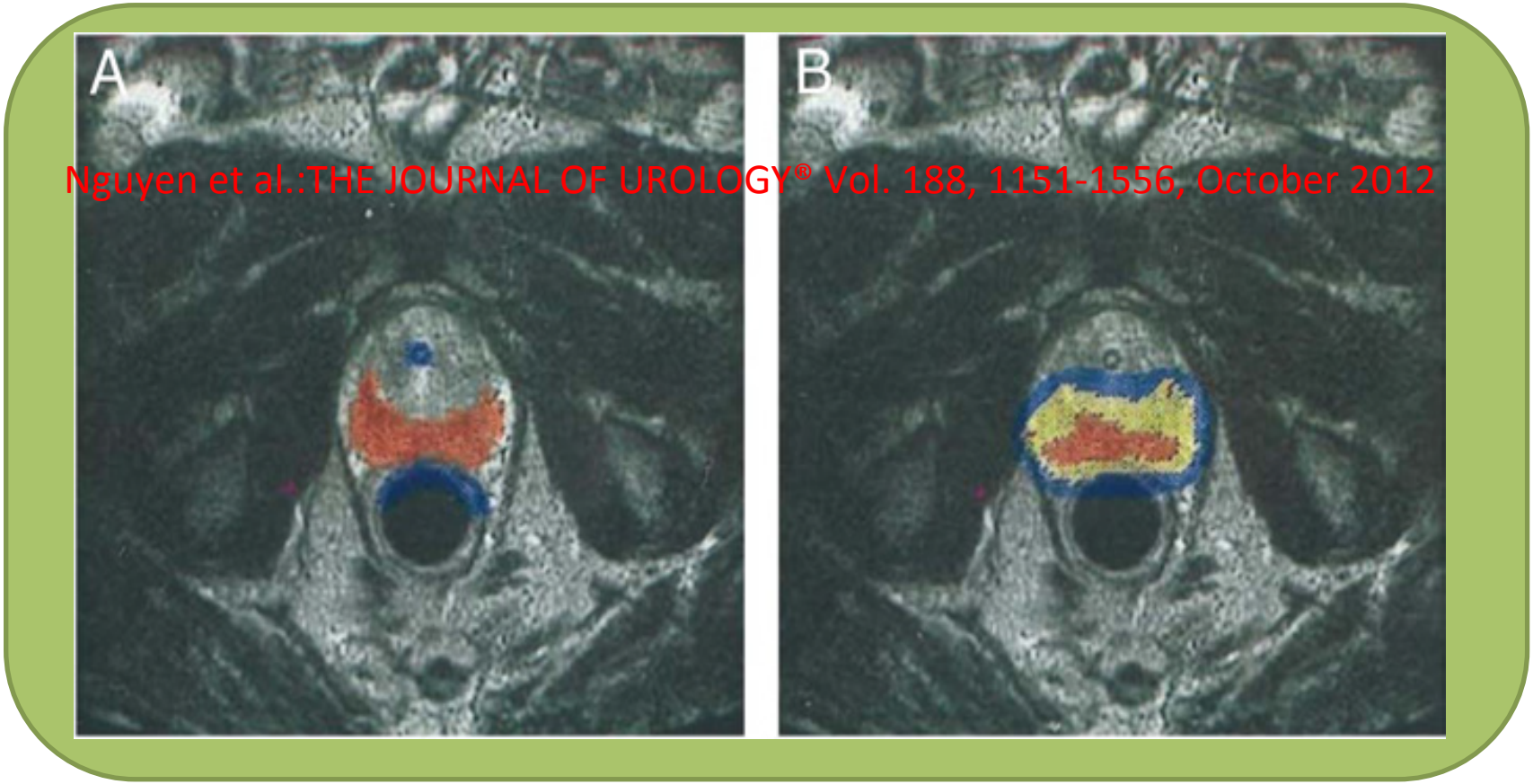
Tipo: V | Livello: 100,00 | Unità di livello: % | Unità di valore: cc | Aggiungi | Cancella | Cancella tutto | Esporta... | OK | Annulla

...E PER VOLARE IN ALTO

iMR –based intraoperative planning BCT

- *Esperienze in brachiterapia prostatica….*

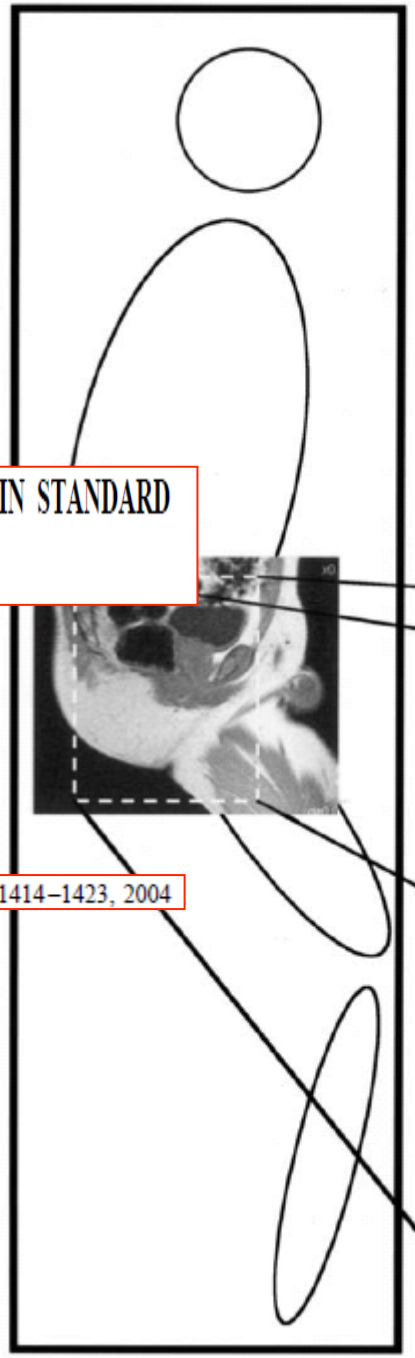
Gruppo D'Amico *Tanaka 2007; Tempany 2008*

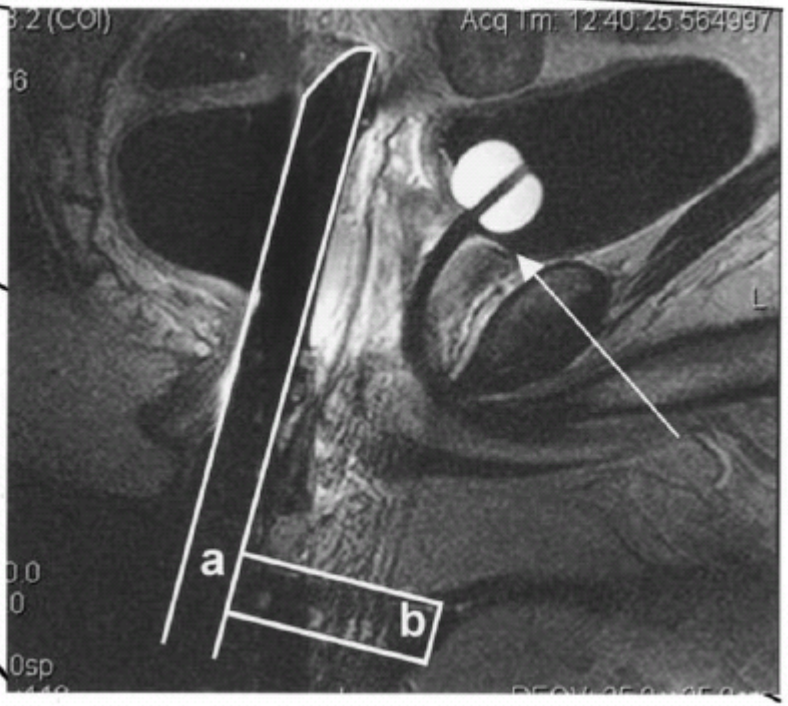


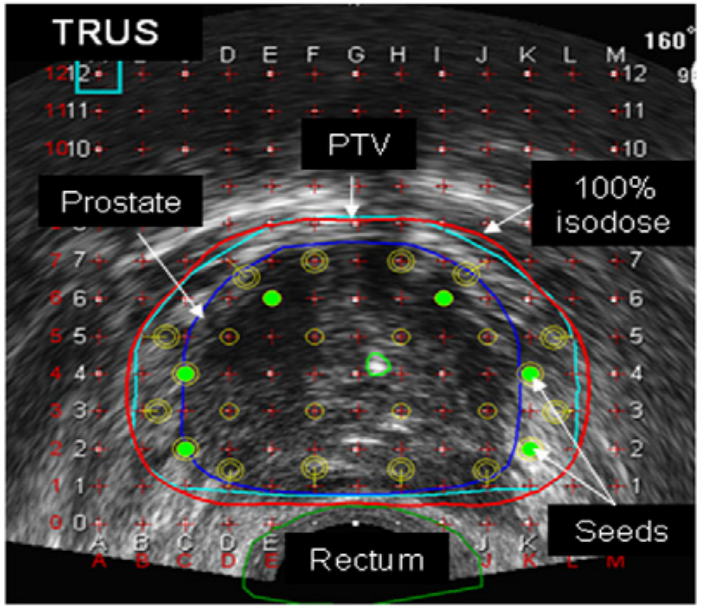
CYNTHIA MÉNARD, M.D.,[1]

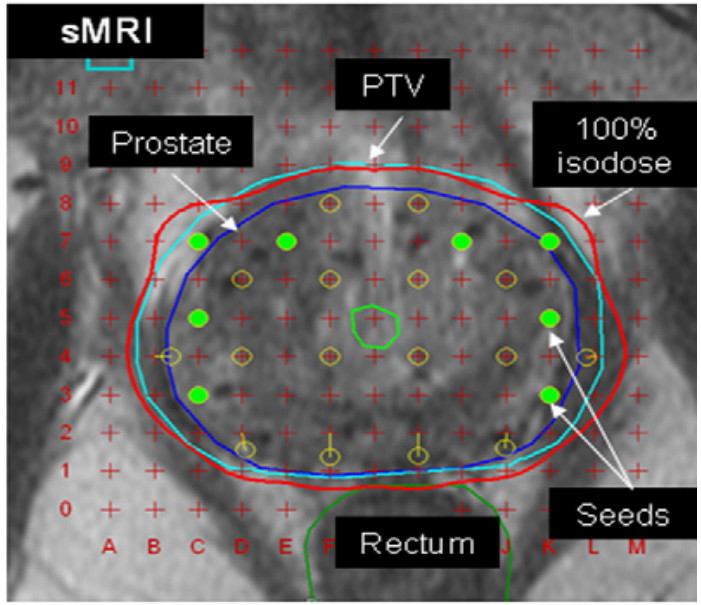
MRI-GUIDED HDR PROSTATE BRACHYTHERAPY IN STANDARD 1.5T SCANNER

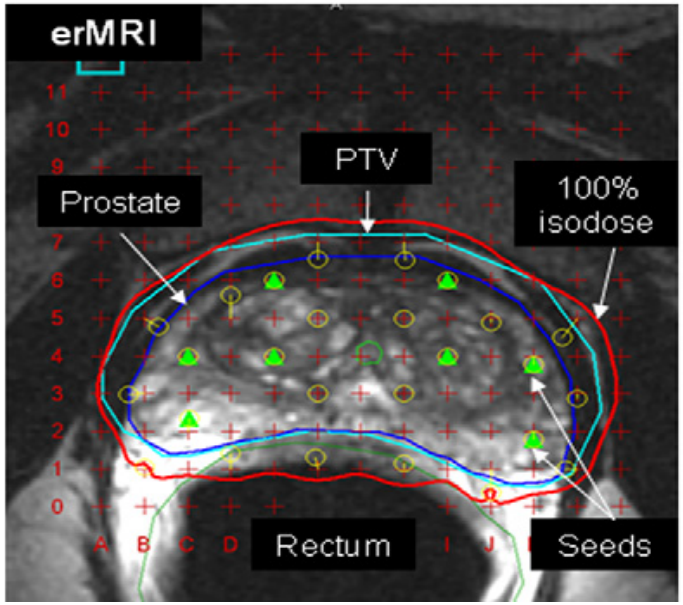
Int. J. Radiation Oncology Biol. Phys., Vol. 59, No. 5, pp. 1414–1423, 2004











J.M. Albert et al.
Brachytherapy 12 (2013)

Le considerazioni per il futuro

Wei et al; Fichtinger et al: Robot- assisted 3D-TRUS guided …2008

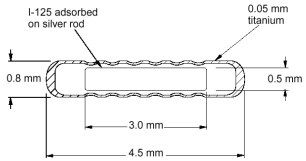
Lagerburg et al. 2006

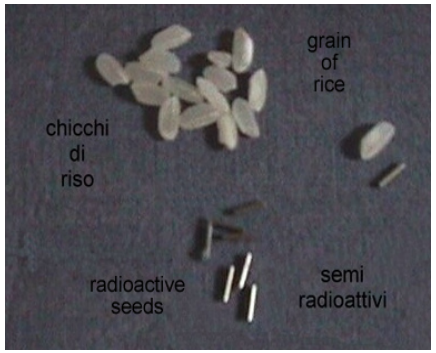
Van Gellecom et al. 2004

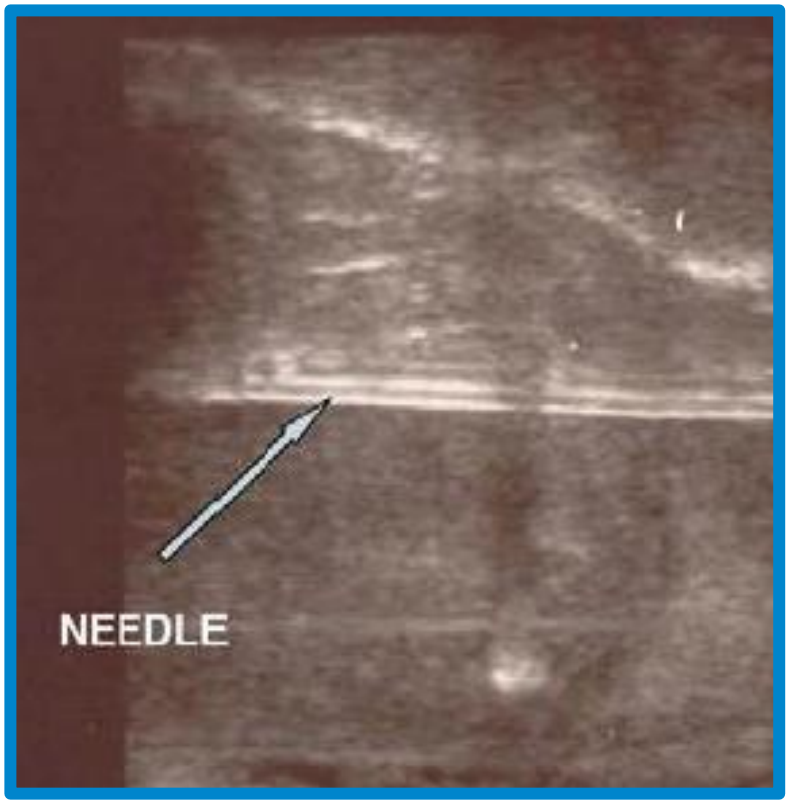
- 3DTRUS-based robots / MRI-based robots
- Immagini funzionali (molecolari) per il planning intraoperatorio
- TRUS

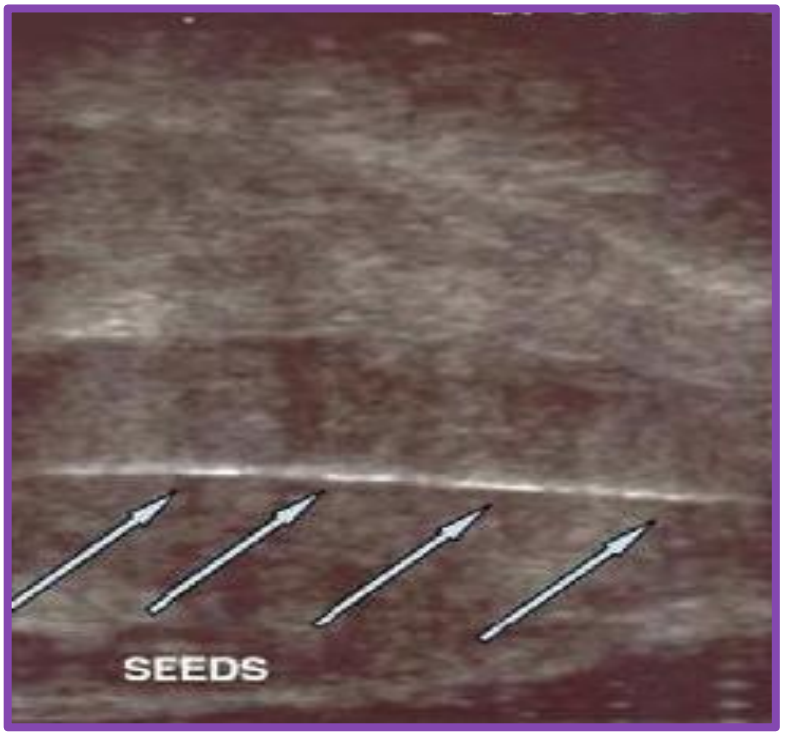
miglioramento immagine (visualizzazione base e piani anteriori, ecogenicità dei semi, contornamento longitudinale refresch immagini)

…maggiore ecogeneicità delle sorgenti

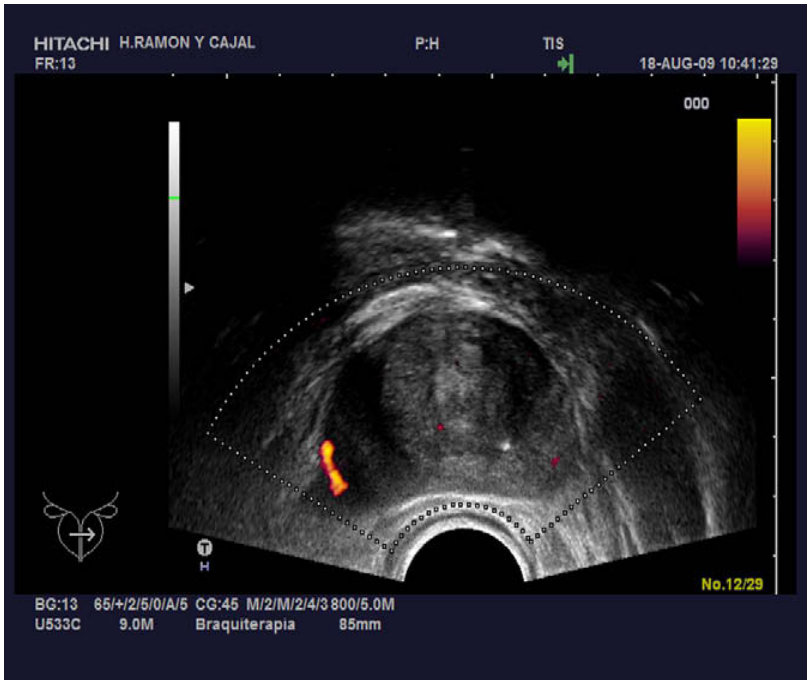


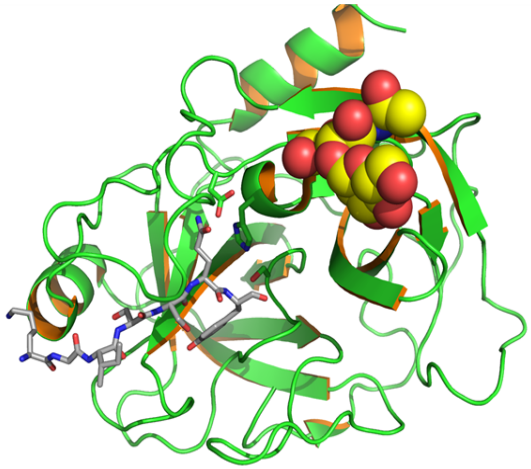






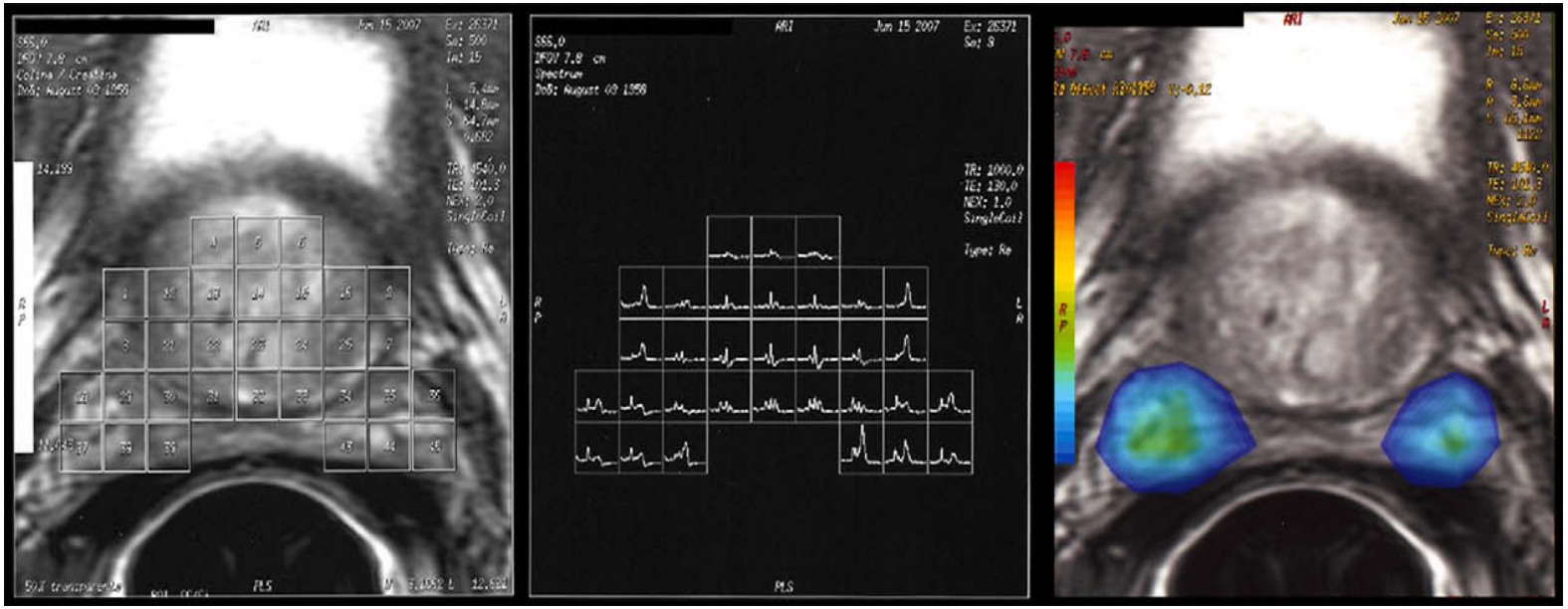
Fusione RMN-TC postimpianto





“MITICO” PSA

Alfredo Polo Radiotherapy and Oncology 94 (2010) 12–23



Conclusioni

…e alla fine mi son fatto "pirsuaso"

Radiotherapy and Oncology 91 (2009) 141–146

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Editorial

Image-guided brachytherapy sets benchmarks in advanced radiotherapy

Richard Pötter

Department of Radiotherapy, Medical University of Vienna, General Hospital of Vienna, Vienna, Austria

2009

Grazie per l'attenzione

> … will be integrated into individualized adaptive radiotherapeutic approaches with a specific focus on limiting volumes at risk accessible by different forms of image-guided radiotherapy, in particular taking into account the advantages of brachytherapy. Such comprehensive approach will exploit the full potential of advanced image-guided radiotherapy for the best therapeutic benefit of our patients.