UNIVERSITÀ DEGLI STUDI
DI MILANO

Aifm
Associazione Italiana di Fisica Medica

STEREOTACTIC BODY RADIATION THERAPY

Implementazione, Sostenibilità, Avanzamento Tecnologico e Risultati a Confronto

24/25 OTTOBRE 2014

Sede del Convegno:
Università degli Studi di Milano
Via Luigi Mangiagalli 25 (Aula Magna),
Milano (MM2 Piola)

SBRT

APPLICAZIONI CLINICHE: RITRATTAMENTI

Barbara Jereczek-Fossa

European Institute of Oncology
University of Milan
Milan, Italy

Milano 25.10.2014

EPIDEMIOLOGIA

Health-care Development

Radiotherapy capacity in European countries: an analysis of the Directory of Radiotherapy Centres (DIRAC) database

Eduardo Rosenblatt, Joanna Izewska, Yavuz Anacak, Yaroslav Pynda, Pierre Scalliet, Mathieu Boniol, Philippe Autier

Radiotherapy is used for cure or palliation in around half of patients with cancer. We analysed data on radiotherapy Lancet Oncol 2013; 14: e79–86

"…Every year 3.2 milion of new cases of cancer in Europe…"

Rosenblatt et al. Lancet Oncol 2013;14:e79-86

RADIOTERAPIA

- ❑45%-55% riceve RT
- ❑20% riceve ≥ 2 trattamenti RT

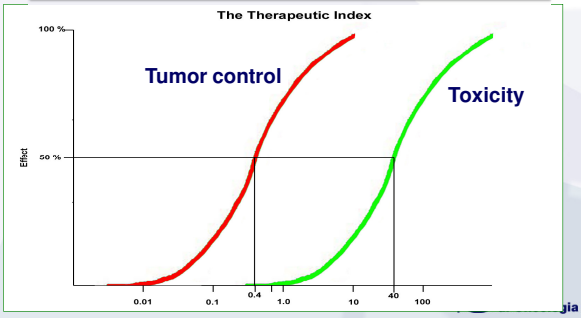
Pazienti guariti:

50% di tutti pz oncologici: 1,6 mln

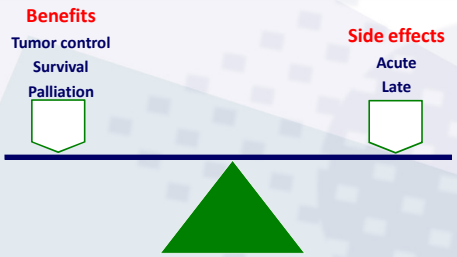
- ❑ 49% con RT (40% RT esclusiva)

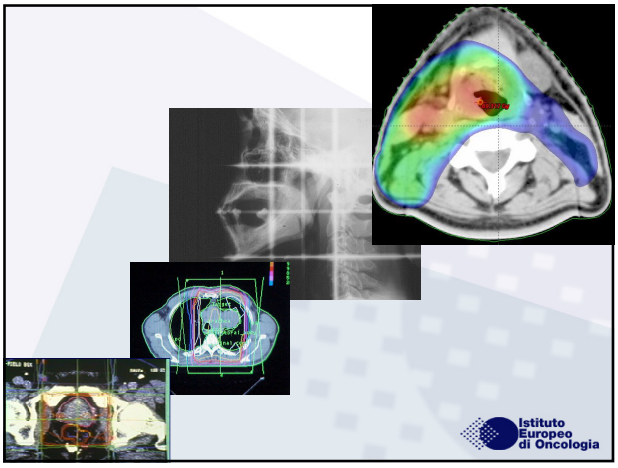
Rosenblatt et al. Lancet Oncol 2013;14:e79-86
Slotman et al. Radiother Oncol 2005;75:349-54.

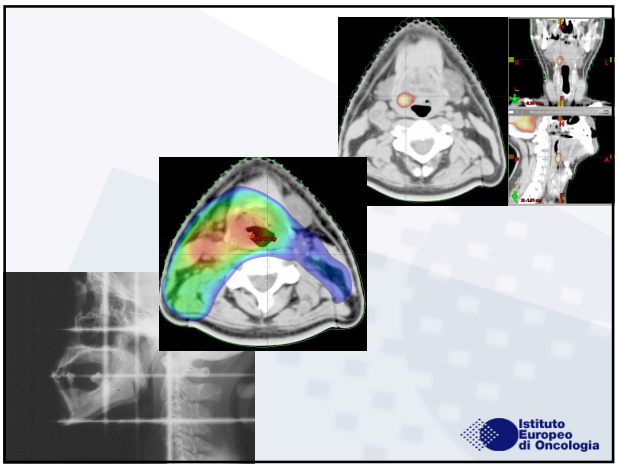
INDICE TERAPEUTICO



INDICE TERAPEUTICO







RI-TRATTAMENTI: recidiva, secondi tumori

Benefits

Tumor control

Survival

Palliation

Side effects

Acute

Late

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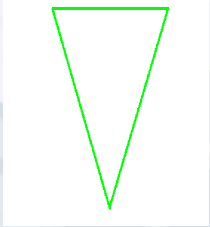
NUOVE TECNOLOGIE

VOLUMI TRATTATI

1. RT monodimensionale
2. RT bidimensionale (2D)
3. RT 3-dimensionale (3D)
4. IMRT intensity modulated RT
5. IGRT Image guided RT
6. Stereotactic RT



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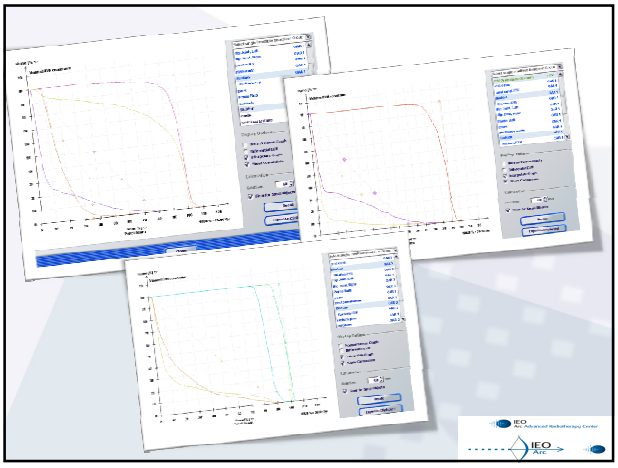

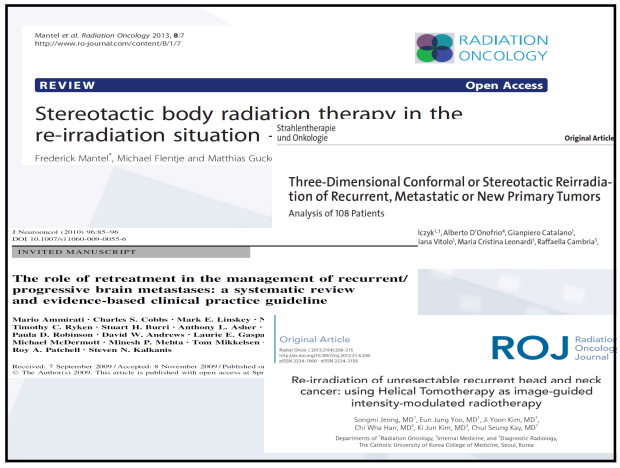

Mantel *et al. Radiation Oncology* 2013, **8**:7
http://www.ro-journal.com/content/8/1/7

RADIATION ONCOLOGY

REVIEW Open Access

Stereotactic body radiation therapy in the re-irradiation situation - Strahlentherapie und Onkologie Original Article

Frederick Mantel*, Michael Flentje and Matthias Guck

Three-Dimensional Conformal or Stereotactic Reirradiation of Recurrent, Metastatic or New Primary Tumors

Analysis of 108 Patients

Iczyk[1], Alberto D'Onofrio[4], Gianpiero Catalano[],
Iana Vitolo[], Maria Cristina Leonardi[], Raffaella Cambria[],

J Neurooncol (2010) 96:85–96
DOI 10.1007/s11060-009-0055-6

INVITED MANUSCRIPT

The role of retreatment in the management of recurrent/progressive brain metastases: a systematic review and evidence-based clinical practice guideline

Mario Ammirati · Charles S. Cobbs · Mark E. Linskey · N
Timothy C. Ryken · Stuart H. Burri · Anthony L. Asher ·
Paula D. Robinson · David W. Andrews · Laurie E. Gaspa
Michael McDermott · Minesh P. Mehta · Tom Mikkelsen ·
Roy A. Patchell · Steven N. Kalkanis

Received: 7 September 2009 / Accepted: 8 November 2009 / Published o
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Original Article

ROJ Radiation Oncology Journal

Re-irradiation of unresectable recurrent head and neck cancer: using Helical Tomotherapy as image-guided intensity-modulated radiotherapy

Songmi Jeong, MD[1], Eun Jung Yoo, MD[1], Ji Yoon Kim, MD[1],
Chi Wha Han, MD[1], Ki Jun Kim, MD[1], Chul Seung Kay, MD[1]

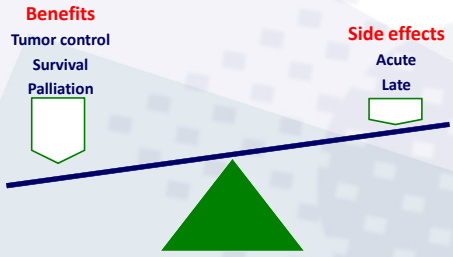
Departments of [1]Radiation Oncology, [2]Internal Medicine, and [3]Diagnostic Radiology,
The Catholic University of Korea College of Medicine, Seoul, Korea

RI-TRATTAMENTI

Intento:

1. Palliativo (sintomatico)
2. Curativo

RI-TRATTAMENTI SBRT



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RADIOBIOLOGIA

1. Tessuti a risposta tardiva (tossicità tardiva)
2. Ipofrazionamento
3. Riparo *recovery*

RECOVERY

Riparo	Tessuti
Completo	Polmonite acuta
Discreto	Midollo spinale
Minimo	Fibrosi polmonare tardiva
Nessun riparo	Cuore Rene Vescica urinaria

Mantel et al. 2013

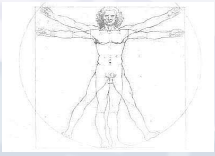
INDICAZIONI (e intento)

1. Istotipo (biologia, radiosensibilità)
2. Localizzazione della recidiva/secondo tumore
3. Vicinanza alle strutture radiosensibili
4. Estensione di neoplasia iniziale e alla recidiva
5. Presenza di altre localizzazioni
6. Pregressi trattamenti
7. Intervallo libero da malattia
8. Disponibilità di altre terapie
9. Condizioni generali (KPS)
10. Età
11. Sintomatologia
12. Preferenze del paziente

RI-TRATTAMENTI SBRT

Distretti:

1. Tumori cerebrali
2. Tumori vertebrali
3. Tumori testa&collo
4. Tumori toracici
5. Tumori addomino-pelvici



RI-TRATTAMENTI SBRT: Tumori vertebrali

Nr studi pubblicati SBRT	9
Nr pz	8-95 (tot: 392 pz)
Nr trattamenti	8-97 (tot 446 tratt)
Dose 1° RT (mediana)	30-40 Gy
Intervallo (mediana)	11-25 m
Dose 2° RT (mediana)	20 Gy/5 fr – 30 Gy/15 fr
EQ2 totale midollo spinale	46,5 Gy – 83,4 Gy
2° RT	IMRT, Tomoterapia, SBRT: CyberKnife con imaging quotidiano
Follow-up	7-17,3 m
Mielotossicità	1 caso (3 casi di neuropatie G3)
Outcome	Controllo locale: 70-100%

Mantel et al. 2013

RI-TRATTAMENTI SBRT: Testa collo

Nr studi pubblicati SBRT	6
Nr pz	22-65 (tot: 206 pz)
Dose 1° RT (mediana)	61-70,2 Gy
Intervallo (mediana)	13-53 m
Dose 2° RT (mediana)	25 Gy/5 fr – 40 Gy/ 5 fr
Volume GTV 2° RT mediano	4,5 cm3 – 75 cm3
Follow-up (mediana)	10-24 m
Tox	1 evento G5, alcuni G4, eventi G3 25%
Outcome	OS a 2 anni: 22 – 64%

Mantel et al. 2013

RI-TRATTAMENTI SBRT: Torace (NSCLC)

Nr studi pubblicati SBRT	3
Nr pz	12-36 (tot: 65 pz)
Nr trattatmenti	12-36 (tot: 65 tratt
Dose 1° RT (mediana)	50-60 Gy
Intervallo	
Dose 2° RT (mediana)	32-60 Gy
D/frazione (mediana)	4-20 Gy
RT	SBRT, CyberKnife (4D-CT, PET)
Volume GTV 2° RT median	14 cm3, diam 1,7 cm
Follow-up (mediana)	12-15 m
Tox	Nessun G4, eventi G3 30% (CENTRALI)
Outcome	Controllo loc 92%, sopravv glob 2 anni 60%

Mantel et al. 2013

RI-TRATTAMENTI SBRT: Addome-Pelvi

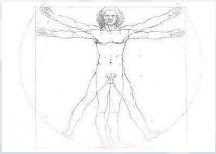
Nr studi pubblicati SBRT	6 (1 addome)
Nr pz	14-36 (tot: 111 pz)
Dose 1° RT (mediana)	50 Gy
Intervallo (mediana)	5-25m
Dose 2° RT (mediana)	20 Gy/4 fr - 30 Gy/3 fr
Follow-up (mediana)	10-9 m
Tox	2 evento G4, alcuni G3
Outcome	OS a 2 anni: 46% Controllo locale a 2 anni: 56-87%

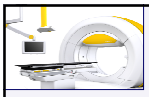
Mantel et al. 2013

ESPERIENZE IEO

SBRT

1. BrainLab
2. BrainLab Vero
3. CyberKnife

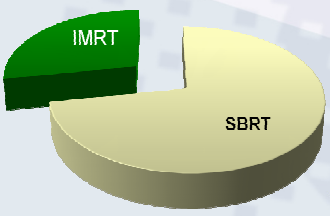




OUR VERO EXPERIENCE

From the 1st April 2012 to the 30th September 2014

1364 patients (10% treated twice or more)



SBRT: 72%

IMRT: 28%

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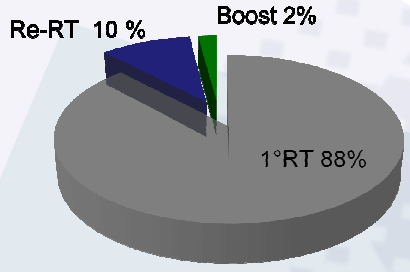
OUR VERO EXPERIENCE: RT COURSE



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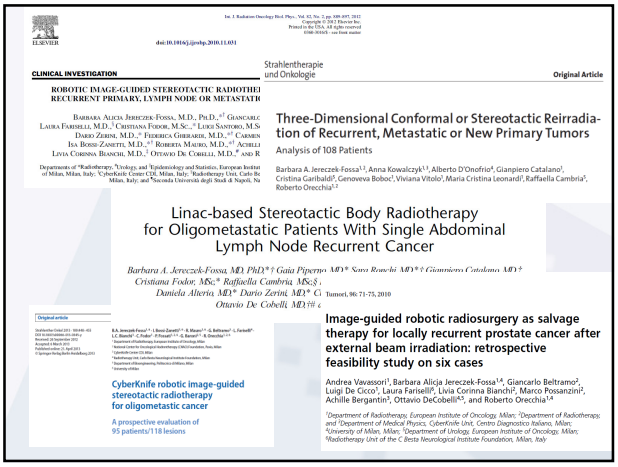


CLINICAL INVESTIGATION

ROBOTIC IMAGE-GUIDED STEREOTACTIC RADIOTHER
RECURRENT PRIMARY, LYMPH NODE OR METASTATI

Strahlentherapie und Onkologie

Original Article

Three-Dimensional Conformal or Stereotactic Reirradiation of Recurrent, Metastatic or New Primary Tumors

Analysis of 108 Patients

Linac-based Stereotactic Body Radiotherapy for Oligometastatic Patients With Single Abdominal Lymph Node Recurrent Cancer

Original article

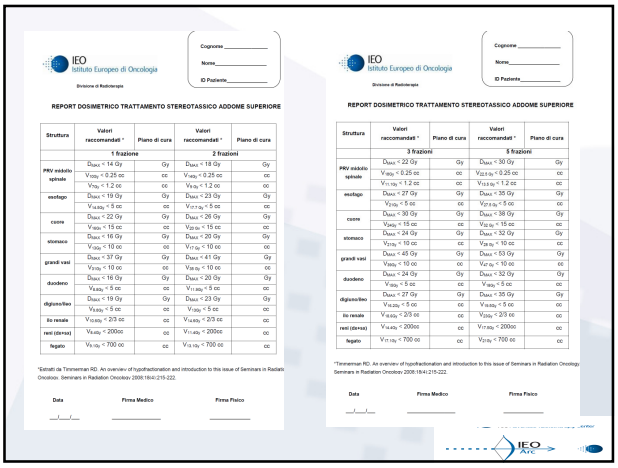
CyberKnife robotic image-guided stereotactic radiotherapy for oligometastatic cancer

A prospective evaluation of 95 patients/118 lesions

Image-guided robotic radiosurgery as salvage therapy for locally recurrent prostate cancer after external beam irradiation: retrospective feasibility study on six cases

REGOLE GENERALI

1. Recuperare il piano precedente
2. Eventuale conferma istologica
3. Alta precisione nella definizione del target (RM, PET, fusione degli esami)
4. RT: tecniche selettive
5. GTV-CTV-PTV margini limitati
6. Dose volume constraints (1/3 dei constraints in base all'intervallo libero ecc.)
7. Dose totale e per frazione in base all'intervallo, volume, KPS
8. Accurato monitoraggio clinico



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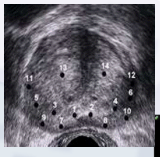
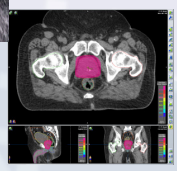
REPORT DOSIMETRICO TRATTAMENTO STEREOTASSICO ADDOME SUPERIORE

RADIOTERAPIA dopo RADIOTERAPIA

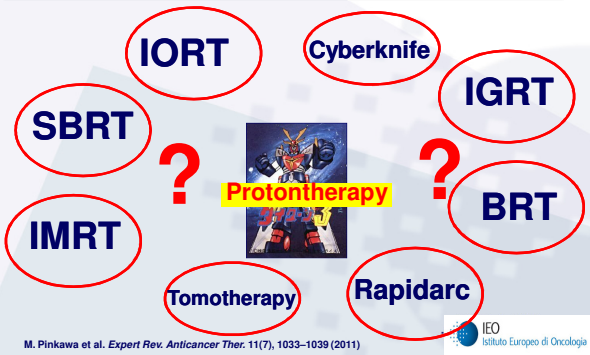
1. Brachiterapia



2. Radioterapia a fasci esterni



Tecnologie della re-irradiazione



M. Pinkawa et al. *Expert Rev. Anticancer Ther.* 11(7), 1033–1039 (2011)

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CASISTICHE EBRT

Autore	Nr. pz	Tecnica	Schema	Risultati
Kalapurakal (2001)	3	EBRT + ipertermia	30-50 Gy /2 Gy/fr)	3/3 controllo di malattia a 1 anno
Vavassori/ Jereczek-Fossa (2010 e 2012)	15	CyberKnife	30 Gy/5 fr	30 m PFS: 23%
Zerini/Jereczek-Fossa (abstract 2013)	22 prostata 10 loggia pr	IMRT, SBRT	25-30 Gy/5 fr	24 m BRFS: 71%

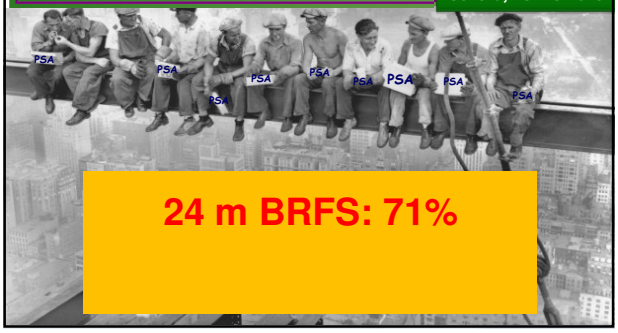
TITLE: re-EBRT FOR PROSTATE CANCER LOCAL RELAPSE AFTER RADICAL, POST-OPERATIVE OR SALVAGE RT: TOXICITIES AND OUTCOME

Geneva, ESTRO 2013

- N= 32 pz (2008 – Aprile 2013): 22+10
- Intervallo RT-recidiva 62 months
- PET/CT-colina positiva in tutti i pz
- Re-RT: Vero, Rapidarc, CBK

TITLE: re-EBRT FOR PROSTATE CANCER LOCAL RELAPSE AFTER RADICAL, POST-OPERATIVE OR SALVAGE RT: TOXICITIES AND OUTCOME

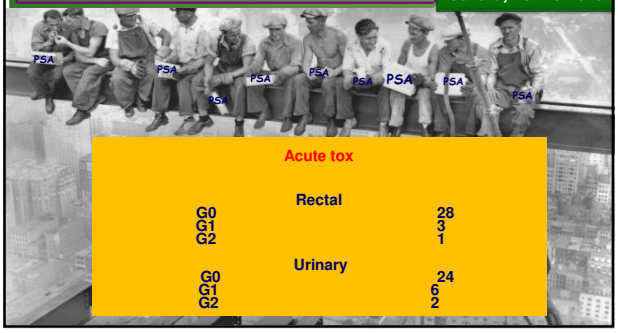
Geneva, ESTRO 2013



24 m BRFS: 71%

TITLE: re-EBRT FOR PROSTATE CANCER LOCAL RELAPSE AFTER RADICAL, POST-OPERATIVE OR SALVAGE RT: TOXICITIES AND OUTCOME

Geneva, ESTRO 2013



Acute tox

Rectal

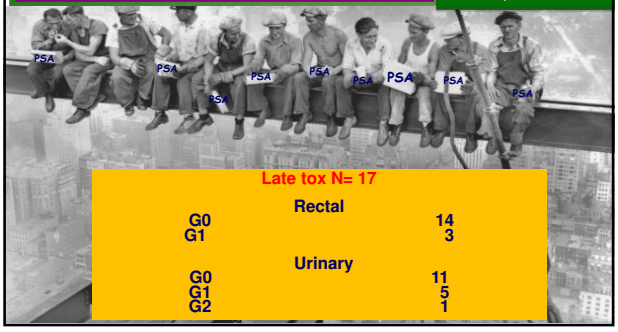
G0	28
G1	3
G2	1

Urinary

G0	24
G1	6
G2	2

TITLE: re-EBRT FOR PROSTATE CANCER LOCAL RELAPSE AFTER RADICAL, POST-OPERATIVE OR SALVAGE RT: TOXICITIES AND OUTCOME

Geneva, ESTRO 2013



Late tox N= 17

Rectal

G0	14
G1	3

Urinary

G0	11
G1	5
G2	1

Alta compliance

Costi contenuti:

Intervallo medio libero da ter. ormonale fino a 3 anni

- Pochi accessi in ospedale
- RT ambulatoriale
- Buon profilo di tox
- Buona qualità della vita

LAVORI IN CORSO

CONCLUSIONI

1. Re-irradiazione SBRT è fattibile e efficace nei pazienti selezionati, con accettabile profilo di tossicità.

2. Rimane indispensabile l'accurata definizione del target e approccio selettivo (imaging, pianificazione e trattamento)

3. Futuri studi: criteri di selezione dei pazienti, dose escalation, associazione con le terapie sistemiche ecc.

Grazie a
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D. Zerini
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Staff TSRM e fisici IEO

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