



#### COSENZA 28 GIUGNO 2013

# LA RADIOTERAPIA PALLIATIVA CON TECNICHE SPECIALI DELLA MALATTIA METASTATICA

TRATTAMENTO NON CHIRURGICO
DELLE OLIGOMETASTASI
LA RADIOTERAPIA DELLA COLONNA





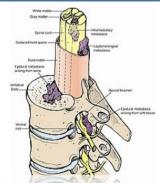
## Secondarismi ossei

IQ Q				
		Mammella	Polmone	Prostata
	Teca	28%	16%	14%
	Coste	59%	65%	50%
	Colonna	60%	43%	60%
	Pelvi	38%	25%	57%
	Ossa lunghe	32%	27%	38%

Rachide dorsale 70%

Rachide lombo-sacrale 20%

Rachide cervicale 10%







## Metastasi Vertebrali

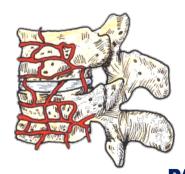
- 40 volte più frequenti di tutti i tumori primitivi
- 40-70% delle metastasi ossee
- Frequenza in aumento con la maggiore sopravvivenza

#### **EMATOGENE >> LINFATICHE O DA INVASIONE DIRETTA**

Non solo fattori emodinamici: tropismo e ricettività locale spesso prevalenti.







corpi ricchi di midollo rosso e di sinusoidi con lento flusso



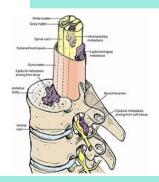


### Metastasi Vertebrali



- 30 90% dei pazienti affetti da neoplasie maligne in fase terminale presenta localizzazioni vertebrali
- 10% dei pazienti con neoplasie maligne sviluppa metastasi vertebrali sintomatiche

Sedi di origine più frequenti: **Prostata, Polmone, Mammella, Rene, Tiroide, Tratto G.I., Malattie Ematologiche** 







# Evoluzione Tecnologica











# Evoluzione Tecnologica

ISTITUTO NAZIONALE TUMORI IRCCS – Fondazione Pascale









# QUALE IL MIGLIOR TRATTAMENTO?

Tomoterapia
Cyberknife
Brain Lab Novalis
Elekta Access
Siemens Artiste
Varian TrueBeam

**Linac based** 

BALANCING ON A KNIFE'S EDGE: EVIDENCE-BASED MEDICINE AND THE MARKETING OF HEALTH TECHNOLOGY



Evidence based medicine: nessuna macchina è migliore delle altre né per efficacia né per effetti collaterali









#### ASSOCIAZIONE ITALIANA DI RADIOTERAPIA ONCOLOGICA

E' pertanto fondamentale per il paziente affidarsi ad un giudizio clinico esperto piuttosto che "cercare" l'apparecchiatura più costosa e moderna disponibile per la sua malattia. Se un'apparecchiatura di quel tipo è utile e non è disponibile, il consiglio di rivolgersi ad un Centro che ne dispone gli sarà dato dallo stesso oncologo radioterapista.



L'APPROPRIATEZZA IN RADIOTERAPIA ONCOLOGICA:
INDICAZIONI E CONSIDERAZIONI
DELL'ASSOCIAZIONE ITALIANA DI RADIOTERAPIA
ONCOLOGICA (AIRO)

Spesso, però, nonostante queste attività, l'opinione pubblica non è messa in condizione di comprendere il punto essenziale, e cioè l'utilità della radioterapia per ogni specifica patologia tumorale (e i grandi progressi clinici realizzati in molti campi) mentre viene sottoposto ad un "bombardamento" di informazioni (spesso poco comprensibili e non contestualizzate) sulle diverse apparecchiature e modalità tecniche per realizzarla.

Versione 01.2012

Dal punto di vista del paziente e del sistema sanitario, il criterio fondamentale per formulare un giudizio sull'opportunità di una determinata scelta terapeutica è quello della appropriatezza clinica, che riguarda ogni atto medico e quindi anche quelli utilizzati dall'oncologo radioterapista. Lali azioni devono essere efficaci, appropriate per il paziente e produrre benefici superiori ai possibili effetti collaterali. Le tecniche più o meno sofisticate e le apparecchiature rappresentano pertanto solo uno strumento per realizzare un atto medico clinicamente appropriato.





## Nuove conoscenze



Terapie Integrate?





## Indicazione al trattamento

- DOLORE (50-75%)
- FRATTURE PATOLOGICHE (8-30%)
- · COMPRESSIONE MIELO-RADICOLARE (5%)

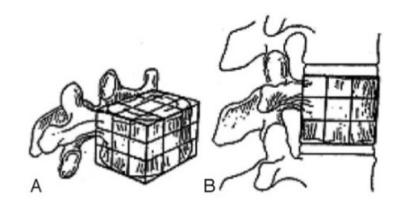
#### **REVIEW ARTICLE**

B.A. Georgy

## Metastatic Spinal Lesions: State-of-the-Art Treatment Options and Future Trends

**SUMMARY:** The purpose of this article is to review the current state of the art for treating symptomatic spinal fractures associated with malignant lesions and to present potential future trends in treatments for this patient population. Epidemiology, clinical presentation, and biomechanical ramifications of these lesions are summarized and treatment regimes, clinical outcomes, and complications and technical issues associated with treatments are presented. Potential future trends and new technologies for performing vertebral body augmentation in patients with metastatic spinal lesions are also discussed.





Modello di Krishnaney: corpo vertebrale rappresentato da 27 cubetti identici

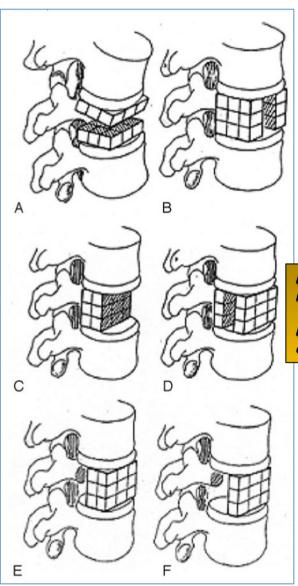




# Indicazione al trattamento?



## Indicazione al trattamento



### REVIEW ARTICLE B.A. Georgy

#### Metastatic Spinal Lesions: State-of-the-Art Treatment Options and Future Trends

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La distruzione del terzo medio assiale è responsabile di grossa instabilità.

La distruzione del terzo medio sagittale non si associa a destabilizzazione significativa.





## Frazionamenti

Randomized Trial of Short- Versus Long-Course Clinical Oncology (2003) 15: 345-352 doi:10.1016/S0936-6555(03)00113-4 **Bone Metastases** 

Overview

Pa

an

8Gy/1f

16Gv/2f

short course)

#### Palliation of Metasta Multifraction Radi

W. M. Sze\*, M.

\*Department of Clinical Oncology, Pame Unit, Velindre NHS Trust, Cardiff, U. Cardiff, U.K.: \$Department of Oncology. Chronic Disease

RASHA ABDELMOTGALLY, M.D.\*\*\*

The Department of Clinical Oncology Center the Department of Radiotherapy, Faculty of Medicine, Mi Nasser Institute, Ministry of Health\*\*\*, Egypt.

30Gy/10f

**CLINICAL INVESTIGATION** 

Bone

#### META-ANALYSIS OF DOSE-FRACTIONATION RADIOTHERAPY TRIALS FOR THE PALLIATION OF PAINFUL BONE METASTASES

Jackson Sai-Yiu Wu, M.D., F.R.C.P.C.,\* Rebecca Wong, M.B.Ch.B., M.Sc., F.R.C.P.C., † MARY JOHNSTON, B.Sc., ANDREA BEZJAK, M.D.C.M., M.Sc., F.R.C.P.C., AND TIMOTHY WHELAN, B.M.B.CH., F.R.C.P.C.,\*

ON BEHALF OF THE CANCER CARE ONTARIO PRACTICE GUIDELINES INITIATIVE SUPPORTIVE CARE GROUP<sup>S</sup>

\*Division of Radiation Oncology, Hamilton Regional Cancer Centre, and Department of Medicine, McMaster University, Hamilton, Ontario, Canada; Department of Radiation Oncology, Princess Margaret Hospital, University of Toronto, Toronto, Ontario, Canada; \*Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario, Canada; \*Program in Evidence-Based Care, Cancer Care Ontario, Ontario, Canada

#### **Patients With Painful Bone Metastases: Cost-Utility Analysis Based on a Randomized Trial**

Wilbert B. van den Hout, Yvette M. van der Linden, Elsbeth Steenland, Ruud G. J. Wiggenraad, Job Kievit, Hanneke de Haes, Jan Willem H. Leer

For the Dutch Bone Metastasis Study Group

RICHARD G 20Gv/4f

32Gy/8f

NORMAND J. LAPERRIERE, D. ANDREW LOBLAW, AND ADRIAN W. LAXTON

RT♪

18G/3f

40Gv/16f

PAOLO MUTO TITUTO NAZIONALE TUMORI



# Frazionamenti?



## Frazionamenti

Table 1. Prospective randomized trials comparing single- vs. multiple-fraction radiotherapy regimens for painful, uncomplicated bone metastases

Study	Patients (n). tumor histologic type	Fractionation	Overall pain relief (%)	Complete response	Acute toxicity (%)	Late toxicity (%)	Repeat treatment rate (%)	Investigator	Year	Reference
Prospective randomized Pl 8-Gy single fraction RT for metastatic skeletal pain: randomized comparison with multifraction	hase III trials 775, various histologic types	8 Gy/1 Fx 20 Gy/5 Fx or 30 Gy/10 Fx	78 78	57 58	30 32	2 1	23 10	Bone Pain Trial Working Party	1999	9
schedule Randomized clinical trial with 2 palliative RT regimens	160, various histologic types	8 Gy/1 Fx 30 Gy/10 Fx	75 86	15 13	13 18	NR NR	28 2	Foro	2008	13
in Spain Radiation Therapy and Oncology	898, breast or prostate cancer	8 Gy/1 Fx 30 Gy/10 Fx	66 66	15 18	10 17	4 4	18 9	Hartsell	2005	11
Group 97-14 Randomized trial of 3 single-dose RT regimens for metastatic	327, various histologic types	4 Gy/1 Fx 6 Gy/1 Fx 8 Gy/1 Fx	59 73 78	21 27 32	32 29 37	6 7 7	42 44 38	Jeremic	1998	7
bone pain Prospective randomised multicenter trial of single-fraction RT (8 Gy × 1) vs. multiple fractions	376, various histologic types	8 Gy/1 Fx 30 Gy/10 Fx	Equivalent Equivalent		NR NR	4 11	15 4	Kaasa	2006	12
(3 Gy × 10) Randomized trial of single-dose vs. fractionate palliative RT for bone metastases	241, various ed histologic types	8 Gy/1 Fx 20 Gy/4 Fx	62 71	15 15	35 35	5 5	21 12	Nielsen	1998	15
Trans-Tasman Radiation cology up 96-05 uropathic pain)	272, various histologic types	8 Gy/1 Fx 20 Gy/5 Fx	53 61	26 27	5 11	5 4	29 24	Roos	2005	10
term ow-up of cer patients ziving RT for the metastases: alts from domized lticenter L—Norway	188, various histologic types	8 Gy/1 Fx 30 Gy/10 Fx	PR PR	PR PR	PR PR	5 5	27 5	Sande	2009	14
al analysis of tch Bone tastasis Study	1,171, variou histologic types	8 Gy/1 Fx 24 Gy/6 Fx	72 69	37 33	Equivalent Equivalent		25 7	Steenland	1999	16

Tutti i frazionamenti hanno mostrato buon controllo del dolore e minima tossicità locoregionale

#### Vantaggio frazioni multiple:

< numero di ritrattamenti nella stessa sede

#### Vantaggi singola fx:

- > Convenienza
- > Compliance del pz







## Frazionamenti

#### **ASTRO GUIDELINE**

## PALLIATIVE RADIOTHERAPY FOR BONE METASTASES: AN ASTRO EVIDENCE-BASED GUIDELINE

Int. J. Radiation Oncology Biol. Phys., Vol. 79, No. 4, pp. 965–976, 2011 2011 American Society for Radiation Oncology and American College of Radiology

- · Efficacia dei vari schemi di frazionamento
- · Indicazione, appropriatezza e rischi della singola frazione di RT
- · Ritrattamenti
- Highly conformal RT
- RT vs chirurgia, radionuclidi, bifosfonati, cifo/vertebroplastica

Lutz S. et al.







## Gestione del dolore da cancro

clinical practice guidelines

Annals of Oncology 23 (Supplement 7): vii139-vii154, 2012 doi:10.1093/annonc/mds233

#### Management of cancer pain: ESMO Clinical Practice Guidelines<sup>†</sup>

C. I. Ripamonti<sup>1</sup>, D. Santini<sup>2</sup>, E. Maranzano<sup>3</sup>, M. Berti<sup>4</sup> & F. Roila<sup>5</sup>, on behalf of the ESMO Guidelines Working Group\*

<sup>1</sup>Supportive Care in Cancer Unit, Fondazione IRCCS, Istituto Nazionale Tumori, Milan, Italy; <sup>2</sup>Oncologia Medica, Università Campus Bio-Medico, Rome, Italy; <sup>3</sup>Department of Oncology, Radiation Oncology Centre, S. Maria Hospital, Terni, Italy: <sup>4</sup>Anaesthesiology Intensive Care and Pain Therapy, University Hospital Parma, Parma, Italy: 5 Department of Medical Oncology, S. Maria Hospital, Terni, Italy

#### Treatment of pain due to bone metastases

Zoledronic acid, denosumab or pamidronate (only in breast cancer) ( plus calcium and vitamin D supplementation) should be given, in addition to antalgic radiotherapy. These drugs showed to delay SREs and to reduce pain. Patients should undergo a preventive dental screening by dentistry prior to initiation the therapy with one of the drug. The optimal duration of these drugs is not completely defined. USE ANALGESIC THERAPY

> zoledronic acid, denosumab, or pamidronate should be given also in

absence of pain. These drugs demonstrated

to delay SRE and the appearance of pain.

Bone pain?

Uncomplicated

bone metastases

Radiotherapy and/or surgery should be promptly considered, when appropriate. Zoledronic acid, denosumab, or pamidronate should be given because showed to delay the first and subsequent SREs. USE ANALGESIC THERAPY

Zoledronic acid. denosumab, or pamidronate should be given because showed to delay the subsequent SREs.



Complicated bone metastases (spinal cord compression or impending fracture)?

NO

The same strategies

suggested for

uncomplicated bone

metastases with or without bone pain



Previous SRE: radiotherapy, bone surgery



Zoledronic acid. denosumab, or pamidronate should be given because showed to delay the first and the subsequent SREs.









## **INDICAZIONI**

Oligometastasi Re-Irradiazione Compressione midollare



Alta conformità di dose Dose radiante più alta su lesione localizzata Maggior risparmio midollo spinale Ridotto rischio di mielite radio-indotta





## Tecnologie avanzate e metastasi ossee

Journal of Bone Oncology 1 (2012) 18-23

Contents lists available at SciVerse ScienceDirect

#### Journal of Bone Oncology

journal homepage: www.elsevier.com/locate/jbo



Review Article

A review of recently published radiotherapy treatment guidelines for bone metastases: Contrasts or convergence?

Stephen Lutz a,\*, Edward Chowb

Department of Radiation Oncology, Blanchard Valley Regional Cancer Center, 15990 Medical Drive South, Findlay, OH 45840, USA

b Department of Radiation Oncology, Odette Cancer Centre, Sunnybrook Health Sciences Centre, University of Toronto, Toronto, Ontario, Canada

#### 2. Radiotherapy for bone metastases

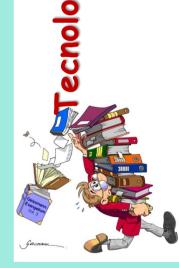
As a palliative intervention, radiotherapy is effective and efficient at treating painful bone metastases, and the side effects

associated with its use are manageable and in nature, Between 50% and 80% of patients relief of their pain following external beam re and complete relief may be seen in up to one beam radiotherapy may be delivered to the of affected bone in the case of recurrent advances have created interest in the pos conformal therapies may improve either the or the duration of the results of treatment, es tumors located in bones of the spine. Th termed stereotactic body radiation therapy (SI ablative body radiotherapy (SABR), and are that deliver intensity modulated radiation the knife therapy. Tomotherapy, or proton the spinal cord compression may receive EBRT adjuvant treatment after surgical decompress vertebroplasty may be used in cases where th

to metastatic bone pain. Furthermore, injectable radiopharmaceuticals such as Strontium 89, Samarium 153, and Radium 223 may be delivered to patients with widespread tumors whose

of affected bone in the case of recurrent pain. Technological advances have created interest in the possibility that highly conformal therapies may improve either the rates of pain relief or the duration of the results of treatment, especially in cases of tumors located in bones of the spine. These treatments are termed stereotactic body radiation therapy (SBRT), or stereotactic ablative body radiotherapy (SABR), and are given by machines that deliver intensity modulated radiation therapy (IMRT), Cyberknife therapy. Tomotherapy, or proton therapy. Patients with

compression, but where spinal instability is noted and contributes histologies are osteoblastic and therefore easily visualized on







## Tecnologie avanzate e dosi

FORUM

## THE DEVELOPMENT OF ADVANCED RADIOTHERAPY TREATMENT TECHNIQUES

#### Matthew Foote

Radiation Oncology, Princess Alexandra Hospital, Brisbane, Queensland, University of Queensland, Brisbane, Queensland. Email: matthew foote@health.gld.gov.au

radiotherapy and stereotactic body radiotherapy. These radiotherapy treatment advances enable sculpted dose distributions, with the ability to monitor and adapt to changes in patient and tumour position during radiotherapy. The purpose of this paper is to review the recent advances in radiotherapy treatment delivery with reference to how this may improve outcomes for cancer patients treated with radiotherapy.

#### Spine SBRT

SBRT is an emerging technology in the multidisciplinary management of benign and malignant spinal/paraspinal tumours. The spine is an ideal site for SBRT due to its relative immobility and potential clinical benefits of high dose delivery to optimise local control, given that disease progression can often result in spinal cord compression. Spinal SBRT is largely used for metastatic disease to the spine and aims to improve on existing rates of clinical

response (eg. pain relief), tumour control, and to reduce re-treatment rates by delivering high biologically effective doses per fraction. Tumour doses typically range from 16 to 24 Gy in a single fraction or 6-9 Gy by three fractions, which are significantly greater than current palliative radiation oncology practice. 31

The role of SBRT in metastatic spine turnours is being evaluated in a randomised trial by the Radiation Therapy Oncology Group (protocol 0631) for patients with significant pain and no history of radiation or surgery. The aim of the trial is to compare pain response after delivery of 16 Gy in a single fraction by using SBRT to delivery of 8 Gy in a single fraction with conventional radiation. However, it does

address the role of higher-dose SBRT in patients who re not received radiotherapy, in patients with previously diated spinal metastases or in postoperative patients.

#### Doses:

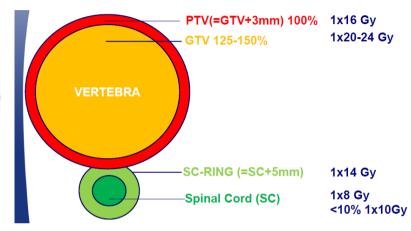
from 16 to 24 Gy in a single fraction or 6-9 Gy by three fractions

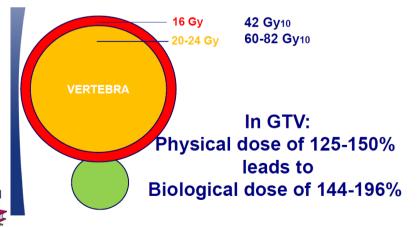




## Tecnologie avanzate e BED

**Spine SBRT** 





## **Spine SBRT BED**





## Tecnologie avanzate e frazionamenti

gery,

J Neurosurg Spine 17:11-18, 2012

Single-session and multisession CyberKnife radiosurgery for spine metastases—University of Pittsburgh and Georgetown University experience

Clinical article

DWIGHT E. HERON, M.D., MALOLAN S. RAJAGOPALAN, M.D., BRA STEVEN BURTON, M.D., PETER C. GERSZTEN, M.D., M.P.H., XINX GREGORY J. GAGNON, M.D., ANNETTE QUINN, R.N., M.S.N., AND

<sup>1</sup>Department of Radiation Oncology, University of Pittsburgh Cancer Institute

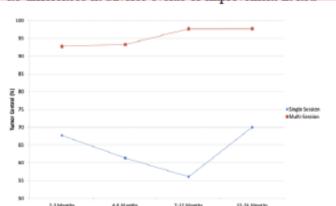


Fig. 2. Radiographic tumor control in the treatment groups. Tumor control, defined as the sum of the percentage of tumors that decreased in size and the percentage that did not grow, was better in the MSG. These results were statistically significant at each time point (p < 0.05).

#### **Controllo dolore > SSG**

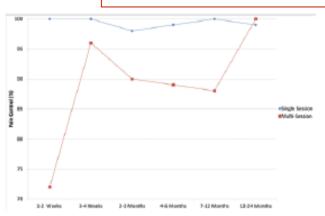


Fig. 1. Pain control in the treatment groups. Pain control, defined as the sum of the percentage of patients with decreased and stable pain, is greater in the SSG. These results are statistically significant at each time point (p < 0.05).

**Controllo Rx tumore > MSG** 





Single-session and multisession CyberKnife radiosurgery for spine metastases—University of Pittsburgh and Georgetown University experience

Clinical article

<sup>1</sup>Department of Radiation Oncology, University of Pittsburgh Cancer Institute; <sup>2</sup>Department of Neurological Surgery, University of Pittsburgh Medical Center; <sup>3</sup>Department of Biostatistics, University of Pittsburgh, Penusylvania; and Departments of \*Radiation Oncology and \*Neurosurgery, Georgetown University Medical Center, Washington, DC

## Tecnologie avanzate e frazionamenti

ecnologie avanzate

Fig. 3. Radiosurgical plan for an L-4 spinal metastasis.

therapy that failed. The rationale for using SRS instead of EBRT is the former's ability to deliver larger doses with greater precision while sparing the spinal cord, as depicted in Fig. 3. Over the past 10 years, several large

**PAOLO MUTO** 





## Tecnologie avanzate e ritrattamenti

Nikolajek et al. Radiation Oncology 2011, **6**:173 http://www.ro-journal.com/content/6/1/173



#### RESEARCH

**Open Access** 

## Spinal radiosurgery - efficacy and safety after prior conventional radiotherapy

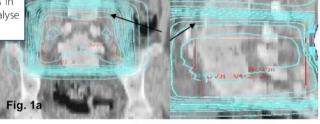
Katharina Nikolajek<sup>1</sup>, Markus Kufeld<sup>2</sup>, Alexander Muacevic<sup>2</sup>, Berndt Wowra<sup>2</sup>, Maximilian Niyazi<sup>1</sup> and

**Background:** Conventional external beam radiotherapy is a standard procedure for treatment of spinal metastases. In case of progression spinal cord tolerance limits further radiotherapy in pre-irradiated areas. Spinal stereotactic radiotherapy is a non-invasive option to re-treat pre-irradiated patients. Nevertheless, spinal radiosurgery results in relevant dose deposition within the myelon with potential toxicity. Aim of the study was to retrospectively analyse the efficacy and feasibility for salvage radiosurgery of spinal metastases.

# Echologie

#### RT convenzionale su L5

RT di salvataggio con SRS



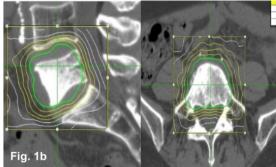


Figure 1 3-D planning in a patient with osseous metastasis in the lumbar vertebral body 5. PTV for conventional radiotherapy (Figure 1a) included L4-L1 (→ = encompassing 95%-isodose). Below (Figure 1b) salvage SRS planning in the same patient at lumbar vertebral body 5 after conventional radiotherapy (green: 70%-isodose, yellow: 60%/50%/40%-isodose, white: 30%/20%-isodose). Abbreviation: SRS = spinal radiosurgery.





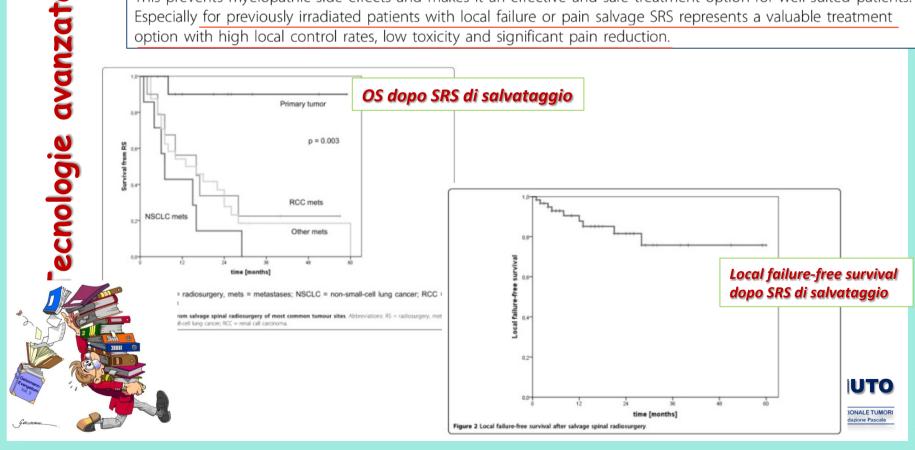
## Tecnologie avanzate e ritrattamenti



Spinal radiosurgery - efficacy and safety after prior conventional radiotherapy

Katharina Nikolajek<sup>1</sup>, Markus Kufeld<sup>2</sup>, Alexander Muacevic<sup>2</sup>, Berndt Wowra<sup>2</sup>, Maximilian Niyazi<sup>1</sup> and

**Conclusions:** By applying spinal radiosurgery relevant radiation doses can be limited to small parts of the myelon. This prevents myelopathic side effects and makes it an effective and safe treatment option for well-suited patients. Especially for previously irradiated patients with local failure or pain salvage SRS represents a valuable treatment option with high local control rates, low toxicity and significant pain reduction.





## Tecnologie avanzate e contouring



International Journal of Radiation Oncology biology • physics

www.redjournal.org

Clinical Investigation: Central Nervous System Tumor

#### International Spine Radiosurgery Consortium Consensus Guidelines for Target Volume Definition in Spinal Stereotactic Radiosurgery

Brett W. Cox, MD,\*'¹ Daniel E. Spratt, MD,\*'¹ Michael Lovelock, PhD,†

Mark H. Bilsky, MD,‡ Eric Lis, MD,§ Samuel Ryu, MD, Jason Sheehan, MD,¶

Peter C. Gerszten, MD, MPH,\*\* Eric Chang, MD,†† Iris Gibbs, MD,‡‡ Scott Soltys, MD,‡‡

Arjun Sahgal, MD,§§ Joe Deasy, PhD,† John Flickinger, MD, Mubina Quader, PhD, Stefan Mindea, MD,¶¶ and Yoshiya Yamada, MD,‡‡

Int J Radiation Oncol Biol Phys, Vol. 83, No. 5, pp. e597—e605, 2012 0360-3016/\$ - see front matter © 2012 Elsevier Inc. All rights reserved. doi:10.1016/j.ijrobp.2012.03.009

#### Summary

Ten physician members of the International Spine Radiosurgery Consortium independently contoured 10 cases representing common scenarios in spinal radiosurgery for metastases. Estimation. Consensus guidelines for target volume definition in spinal stereotactic radiosurgery for metastatic disease were generated. This report serves as a foundation for refining radiosurgery target volume delineation. We advocate using consensus target definitions in future spine radiosurgery protocols.







## Tecnologie avanzate e contouring

## 10 cases





28 giugno

COS Table 1 Summar

International Spine Radiosurgery Consortium Consensus Cuidalinas far Tarast Valuma Dafinitian in Cainal

Case 1: L5 lesion limited to the anterior VB with no epidural extension













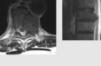




CT

Case 2: T8 lesion involving left pedicle, posterolateral VB, and neural foramen. Involvement of the ventral and left lateral epidural space, mild spinal canal compromise, and abutment of the spinal cord







Case 8: T10 lesion in posterior VB

Table 1 (continued)



Clinical Investigation: Central Naryous System Tumor







Case 3: T6-8 lesion with T6 collapse deformity, ventral epidural disease, moderate spinal canal compromise, mild spinal cord displacement, extension to the bilateral neural foramina, and paraspinal extension

Case 4: T11 lesion involving pedicle

and posterior elements, mild ventral

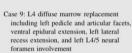
and right lateral epidural disease, narrowing of the right T10/11 and T11/12 neural foramina









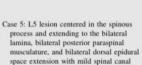




















Case 10: T5 lesion with mild superior and inferior endplate infractions resulting in mild loss of VB height. Mild anterior paraspinal extension. Patient underwent T5 kyphoplasty









Case 6: L2-3 expansile mass in right-sided VB and right posterior elements with mild right ventral, lateral, and dorsal epidural disease. Involvement of the right L2/3 and L3/4 neural foramina









Abbreviations: CT = computed tomography; MRI = magnetic resonance imaging; VB = vertebral body.







## RAOCiazione Italiana Rabinteropia Oncelogica TRATTAMENTO NON CHIRURGICO DELLE OLIGOMETASTASI LA RADIOTERAPIA DELLA COLONNA LA RADIOTERAPIA PALLIATIVA CON TECNICHE SPECIALI DELLA MALATTIA METASTATICA COSENZA 28 giugno 2013 ecnologie avanzate 3 10 **PAOLO MUTO Individual contours** consensus contours

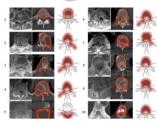
ISTITUTO NAZIONALE TUMORI IRCCS – Fondazione Pascale



cnologie avanzat

## Tecnologie avanzate e contouring

## Summary guidelines



e604 Cox et al.

International Journal of Radiation Oncology • Biology • Physics

Table 4	Summary of contouring guidelines for GTV, CTV, and PTV in spinal stereotactic radiosurgery

Target volume	Guidelines
GTV	Contour gross tumor using all available imaging
	<ul> <li>Include epidural and paraspinal components of tumor</li> </ul>
CTV	<ul> <li>Include abnormal marrow signal suspicious for microscopic invasion</li> </ul>
	<ul> <li>Include bony CTV expansion to account for subclinical spread</li> </ul>
	Should contain GTV
	• Circumferential CTVs encircling the cord should be avoided except in rare instances where the vertebral body,
	bilateral pedicles/lamina, and spinous process are all involved or when there is extensive metastatic disease along
	the circumference of the epidural space without spinal cord compression
PTV	Uniform expansion around CTV
	• CTV to PTV margin ≤3 mm
	• Modified at dural margin and adjacent critical structures to allow spacing at discretion of the treating physician
	unless GTV compromised
	Never overlaps with cord
	Should contain entire GTV and CTV

Abbreviations: CTV = clinical target volume; GTV = gross tumor volume; PTV = planning target volume.





## Tecnologie avanzate e planning

## Tomotherapy



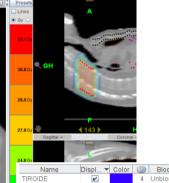




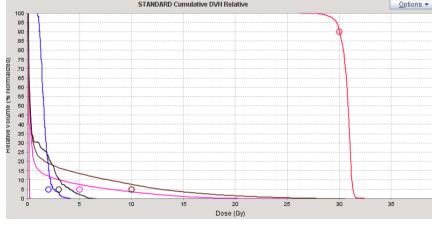
## Tecnologie avanzate e planning

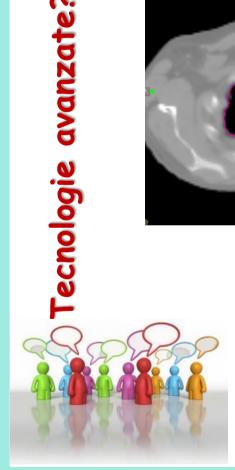
## Tomotherapy





Name	Displ ▼	Color	0	Blocked	Use	Importance	Max Dose [Gy]	Max Dose Pen.	DVH Vol	DVH Dose [Gy]
TIROIDE	V		4	Unblocked	V	10	10.00	1	5.00	2.00
pOLMONE DX	✓		5	Unblocked	₽'	10	20.00	1	5.00	5.00
POLMONE SIN	<b>V</b>		6	Unblocked	₽′	10	25.00	1	5.00	10.00
CUORE	✓		7	Unblocked						
STERNO	<b>V</b>		8	Unblocked	✓	1	5.00	1	5.00	3.00



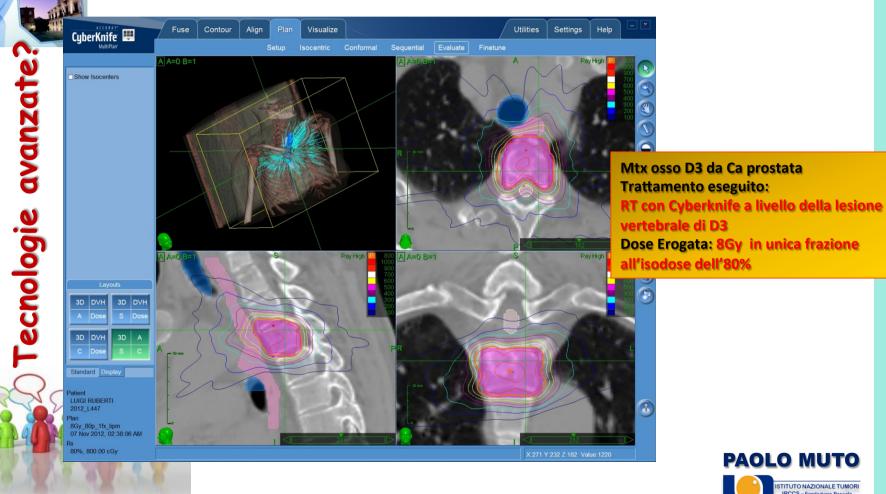






## Tecnologie avanzate e planning

## Cyberknife





# LA RADIOTERAPIA PALLIATIVA CON TECNICHE SPECIAL DELLA MALATTIA METASTATICA COSENZA 28 giugno 2013 Tecnologie avanzate

## Tecnologie avanzate e planning

## Cyberknife







**Fecnologie avanzate?** 

## Tecnologie avanzate e planning

## Cyberknife

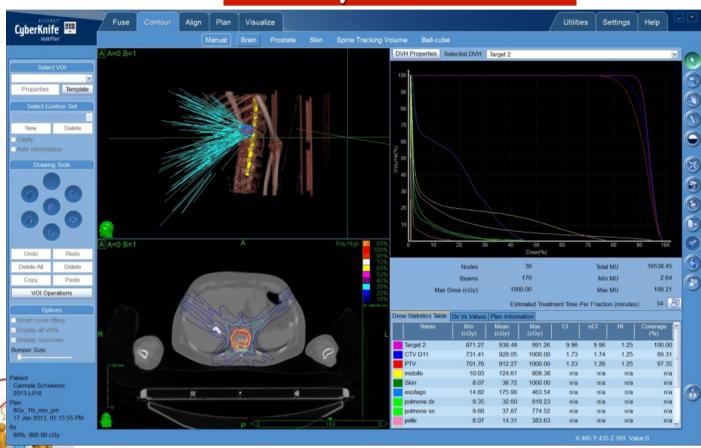
ISTITUTO NAZIONALE TUMORI IRCCS – Fondazione Pascale



# LA RADIOTERAPIA PALLIATIVA CON TECNICHE SPECIAL DELLA MALATTIA METASTATICA COSENZA 28 giugno 2013 Tecnologie avanzate

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## Conclusioni

NE DEL PAZIENTE **ADVANCED** 



Conoscenza



ASSOCIAZIONE ITALIANA DI RADIOTERAPIA ONCOLOGICA

L'APPROPRIATEZZA IN RADIOTERAPIA ONCOLOGICA: INDICAZIONI E CONSIDERAZIONI **DELL'ASSOCIAZIONE ITALIANA DI RADIOTERAPIA** ONCOLOGICA (AIRO)

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