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AIRO2022

Radioterapia di precisione per un'oncologia innovativa e sostenibile

BOLOGNA, 25-27 NOVEMBRE
PALAZZO DEI CONGRESSI

 Associazione Italiana
Radioterapia e Oncologia clinica

 Società Italiana di Radiobiologia

 Associazione
Italiana
Radioterapia
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Stereotactic radiotherapy in patients with bone oligometastases

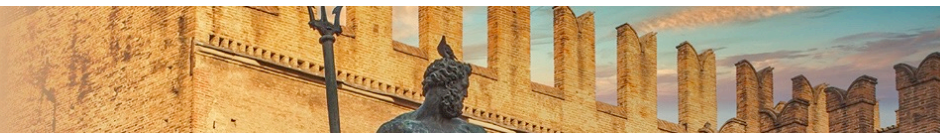
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DICHIARAZIONE

Relatore: ALFONSO FERRERO

Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- Posizione di dipendente in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Consulenza ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Fondi per la ricerca da aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazione ad Advisory Board **(NIENTE DA DICHIARARE)**
- Titolarità di brevetti in compartecipazione ad aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Partecipazioni azionarie in aziende con interessi commerciali in campo sanitario **(NIENTE DA DICHIARARE)**
- Altro



BACKGROUND

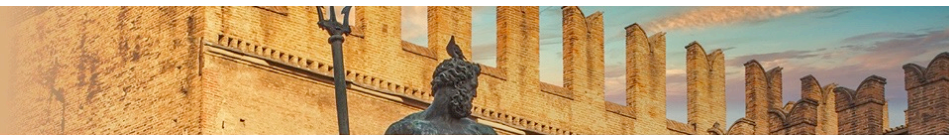
- Oligometastatic disease can benefit from loco-regional treatment.
- Working towards SBRT as the precision medicine choice for OMD.
- In literature SBRT on spinal bone metastases has been found better in terms of LC and analgesic response versus conventional radiation therapy.
- Eterogeneous entities like OMD have spawned new secondary endpoints
- Efforts are currently made to understand benefits of SBRT in all kinds of bone metastases.

Sahgal et al., Int J Radiat Oncol Biol Phys. 2020 Dec 1;108(5):1397-1398

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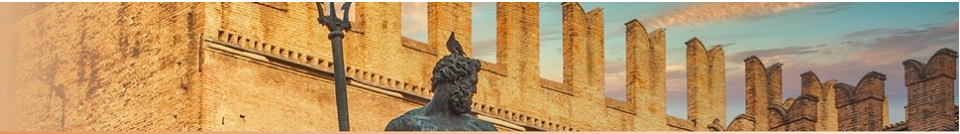
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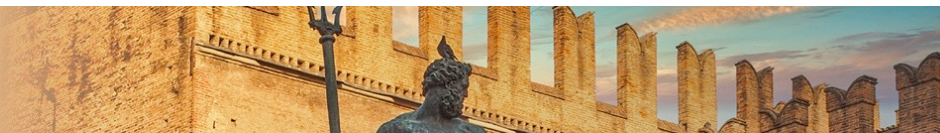
AIMS

To assess the outcomes of oligometastatic patients treated with stereotactic body radiotherapy (SBRT) on bone lesions.



STUDY CHARACTERISTICS

- Retrospective analysis
- All patients with bone metastases treated with SBRT at our center from February 2021 to October 2022.
- Oligopersistent / oligoprogressive / oligorecurrent disease from solid cancer
- Symptomatic or asymptomatic lesions - Numeric rating scale (NRS) was used to evaluate pain value during clinical examination with finger pressure and physical limitation assessment
- Surgical intervention yes/no
- Imaging examinations according to primary lesion



CONTOURING

Spine mets

Baseline Imaging: MRI mandatory

Delineation: Cox et al Guidelines (ASTRO, IJROBP 2012)

**International Spine Radiosurgery Consortium
consensus guidelines for target volume definition in
spinal stereotactic radiosurgery**

Brett W Cox ¹, Daniel E Spratt, Michael Lovelock, Mark H Bilsky, Eric Lis, Samuel Ryu, Jason Sheehan,
Peter C Gerszten, Eric Chang, Iris Gibbs, Scott Soltys, Arjun Sahgal, Joe Deasy, John Flickinger,
Mubina Quader, Stefan Mindea, Yoshiya Yamada

Affiliations + expand
PMID: 22608954 DOI: 10.1016/j.ijrobp.2012.03.009

Non Spine mets

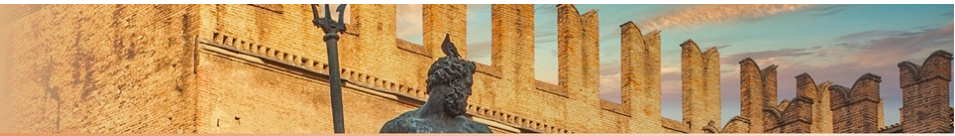
Baseline Imaging: TC, RM, PET

Delineation: Internal protocol, from 09/2021 Nguyen et al guidelines

**International Multi-institutional Patterns of
Contouring Practice and Clinical Target Volume
Recommendations for Stereotactic Body Radiation
Therapy for Non-Spine Bone Metastases**

Timothy K Nguyen ¹, Lee Chin ², Arjun Sahgal ², Roi Dagan ³, Wietse Eppinga ⁴,
Matthias Guckenberger ⁵, Jin Ho Kim ⁶, Simon S Lo ⁷, Kristin J Redmond ⁸, Shankar Siva ⁹,
Bradley J Stish ¹⁰, Rachel Chan ¹¹, Liam Lawrence ¹², Angus Lau ¹³, Chia-Lin Tseng ¹⁴

Affiliations + expand
PMID: 34509549 DOI: 10.1016/j.ijrobp.2021.09.004



SPINE METASTASES

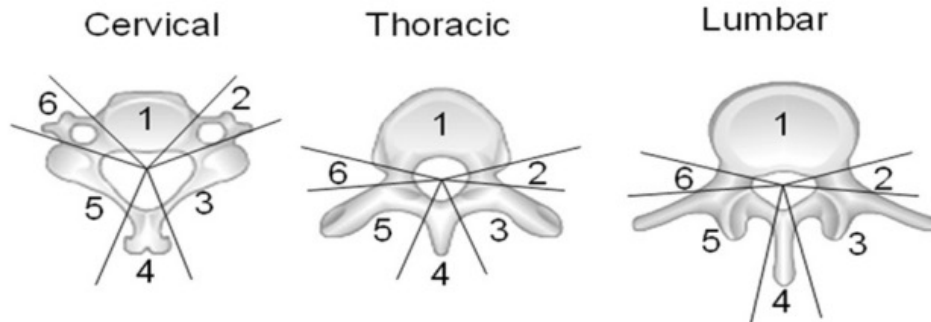


Table 4 Summary of contouring guidelines for GTV, CTV, and PTV in spinal stereotactic radiosurgery

Target volume	Guidelines
GTV	<ul style="list-style-type: none"> Contour gross tumor using all available imaging Include epidural and paraspinal components of tumor
CTV	<ul style="list-style-type: none"> Include abnormal marrow signal suspicious for microscopic invasion Include bony CTV expansion to account for subclinical spread 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	<ul style="list-style-type: none"> 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

Table 1. SINS

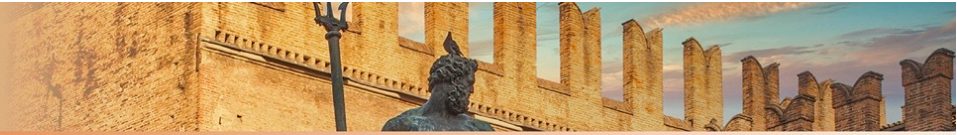
SINS Component	Score
Location	
Junctional (occiput-C2, C7-T2, T11-L1, L5-S1)	3
Mobile spine (C3-C6, L2-L4)	2
Semirigid (T3-T10)	1
Rigid (S2-S5)	0
Pain*	
Yes	3
Occasional pain but not mechanical	1
Pain-free lesion	0
Bone lesion	
Lytic	2
Mixed (lytic/blastic)	1
Blastic	0
Radiographic spinal alignment	
Subluxation/translation present	4
De novo deformity (kyphosis/scoliosis)	2
Normal alignment	0
Vertebral body collapse	
> 50% collapse	3
< 50% collapse	2
No collapse with > 50% body involved	1
None of the above	0
Posterolateral involvement of spinal elements†	
Bilateral	3
Unilateral	1
None of the above	0

NOTE. Data adapted.¹⁴

Abbreviation: SINS, Spinal Instability Neoplastic Score.

*Pain improvement with recumbency and/or pain with movement/loading of spine.

†Facet, pedicle, or costovertebral joint fracture or replacement with tumor.



NON-SPINE BONE METASTASES

- Intraosseus CTV margin of 5-10 mm within contiguous bone
- Extraosseus CTV margin of 5-10 mm in case of associated soft tissue disease and/or significant cortical bone disruption
- All CTVs should be manually cropped to respect natural anatomical barriers to spread including: uninvolved joint spaces, uninvolved OARs, peritoneal cavity, pleura, and intact cortical bone

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RESULTS

Population Analysis

Lesions Characteristics

RT characteristics

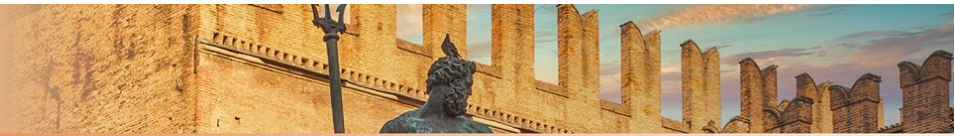
Toxicities



POPULATION ANALYSIS

- The clinical data of 28 patients with 36 lesions undergoing SBRT were retrospectively evaluated.
- Median age was 68 (range 48-78). All pts but one presented oligorecurrence on bones site.
- Median follow-up of 5.3 months (range: 0.4-30.3)

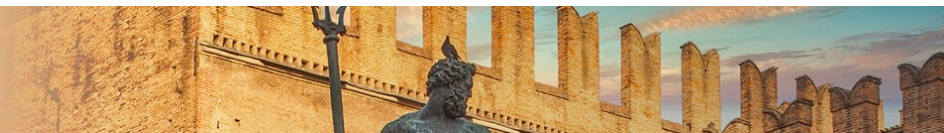
Patient-level Characteristics	Non-spine bone only N=14	Spine only N=11	Both non-spine bone and spine N=3
Age, mean	64,8	67,2	66,3
Male	2 (14,3%)	3 (27,3%)	1 (33,3%)
Primary Site			
- CRC	1	1	0
- Breast	8	6	2
- Prostate	0	1	1
- Melanoma	1	1	0
- Ovary	1	0	0
- NSCLC	0	2	0
- SCLC	1	0	0
- KCC	2	0	0
Metastatic at diagnosis	4	1	0



LESIONS CHARACTERISTICS

- 18 lesions (50%) were in spinal region and 18 (50%) on non-spinal sites.
- 14/36 lesions (39%) were symptomatic with a median NRS of 5 (range: 2-8)
- 8/14 (57%) of painful lesions were non spine, with pelvis being the most common location (75%)

Lesion-level characteristics	Non-spine bone lesions N=18	Spine lesions N=18
Non-spine bone locations		
- Hip/Lower limb	3	N/A
- Pelvis	9	
- Rib	2	
- Shoulder/Upper Limb	1	
- Skull	2	
- Sternum	1	
Spinal level locations		
- C-Spine	N/A	2
- T-Spine		11
- L-Spine		4
- Sacrum		1
Target individuation additional imaging		
- CT	3	0
- MR	0	1
- PET	6	0
- Multi-imaging	9	17
Symptomatic	8	6
Re-irradiation	1	0



TREATMENT

- Median total dose was 30 Gy (range: 21-50), median dose per fraction was 10 Gy (range: 6-12) and median number of fractions were 3 (range: 2-5)

Lesion-level characteristics	Non-spine bone lesions N=18	Spine lesions N=18
RT Prescription (Gy/fractions)		
- 21-24/3	0	10
- 24/2	0	6
- 30-35/3-5	7	2
- 40/4	1	0
- 50/5	10	0



TOXICITIES

- No severe toxicity ($\geq G3$) were detected, 26/28 (93%) pts did not report RT-related symptoms at the end of the therapy, other 2 pts (7%) presented mild symptoms (pain flare, 2 pts) on an iliac bone lesion and on a T6 vertebral lesion respectively
- 24/28 (86%) pts demonstrated a radiological local control, the other 4/28 (14%) were in radiological progression on the SBRT's target (3 spine lesions, 1 rib lesion)

Follow-up characteristics	Non-Spine bone lesions	Spine lesions
- Median follow-up (months)	5.1	5.5
- Local control	17 (94.4%)	15 (83.3%)
Toxicities		
- Pain flare	1	1



CONCLUSIONS

- As stated in literature, SBRT on spinal bone metastases results feasible and safe
- SBRT on non-spine bone metastases appears just as well-tolerated by patients
- Most patients showed complete remission of symptoms

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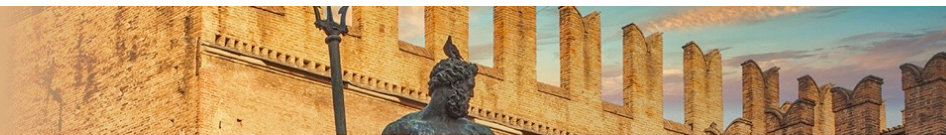
FUTURE PERSPECTIVES

More in-depth evaluation of QoL in those patients is being accounted in a prospective study.

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THANK YOU FOR YOUR ATTENTION

