

XXV CONGRESSO NAZIONALE

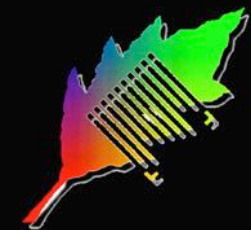
AIRO 2015

Re-irradiazione: standard clinico o ricerca?

# Re-irradiazione neoplasie toraciche



Marco Trovò  
Rimini, 9 Novembre 2015



## DICHIARAZIONE

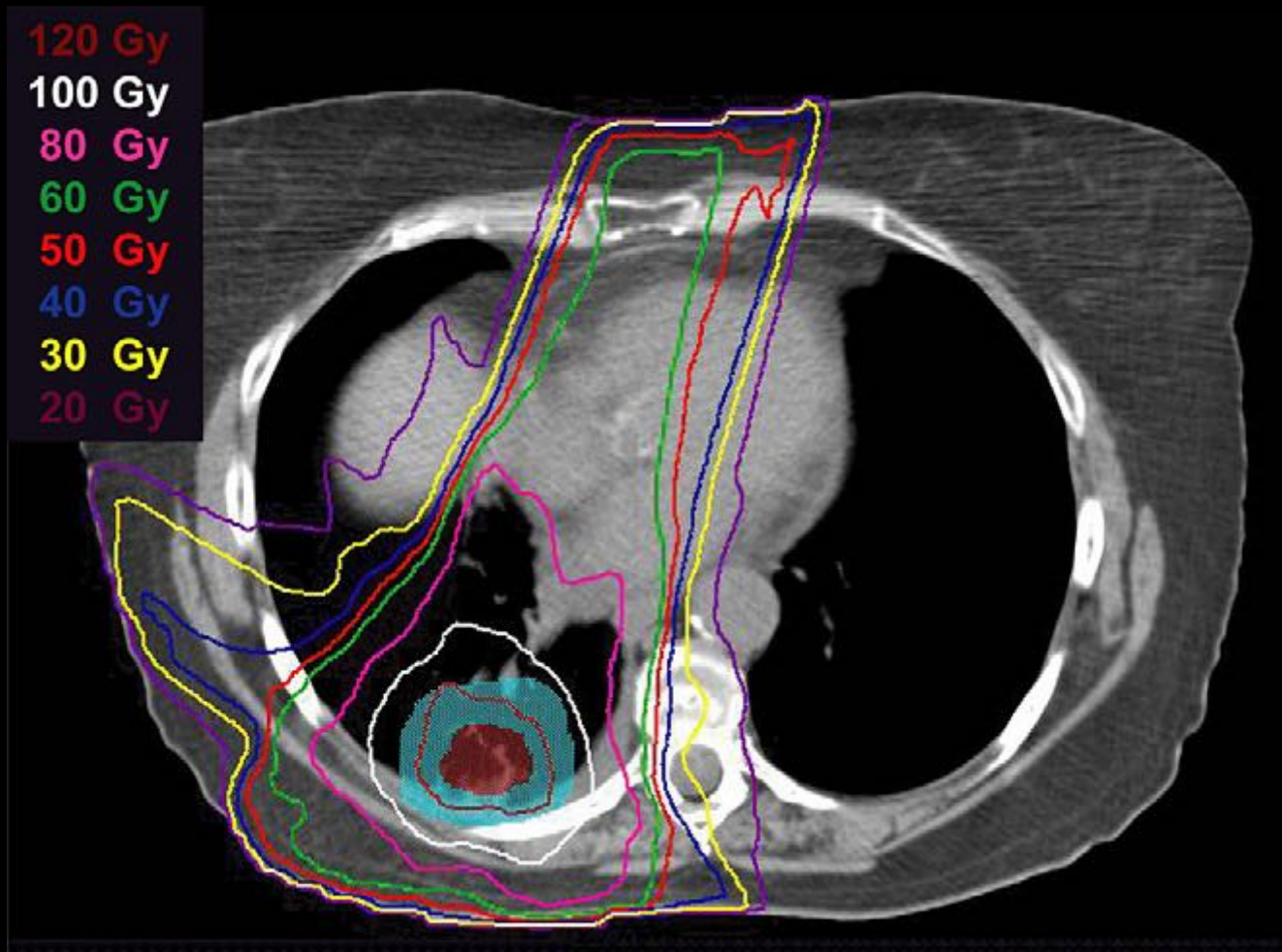
Come da nuova regolamentazione della Commissione Nazionale per la Formazione Continua del Ministero della Salute, è richiesta la trasparenza delle fonti di finanziamento e dei rapporti con soggetti portatori di interessi commerciali in campo sanitario.

- 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**

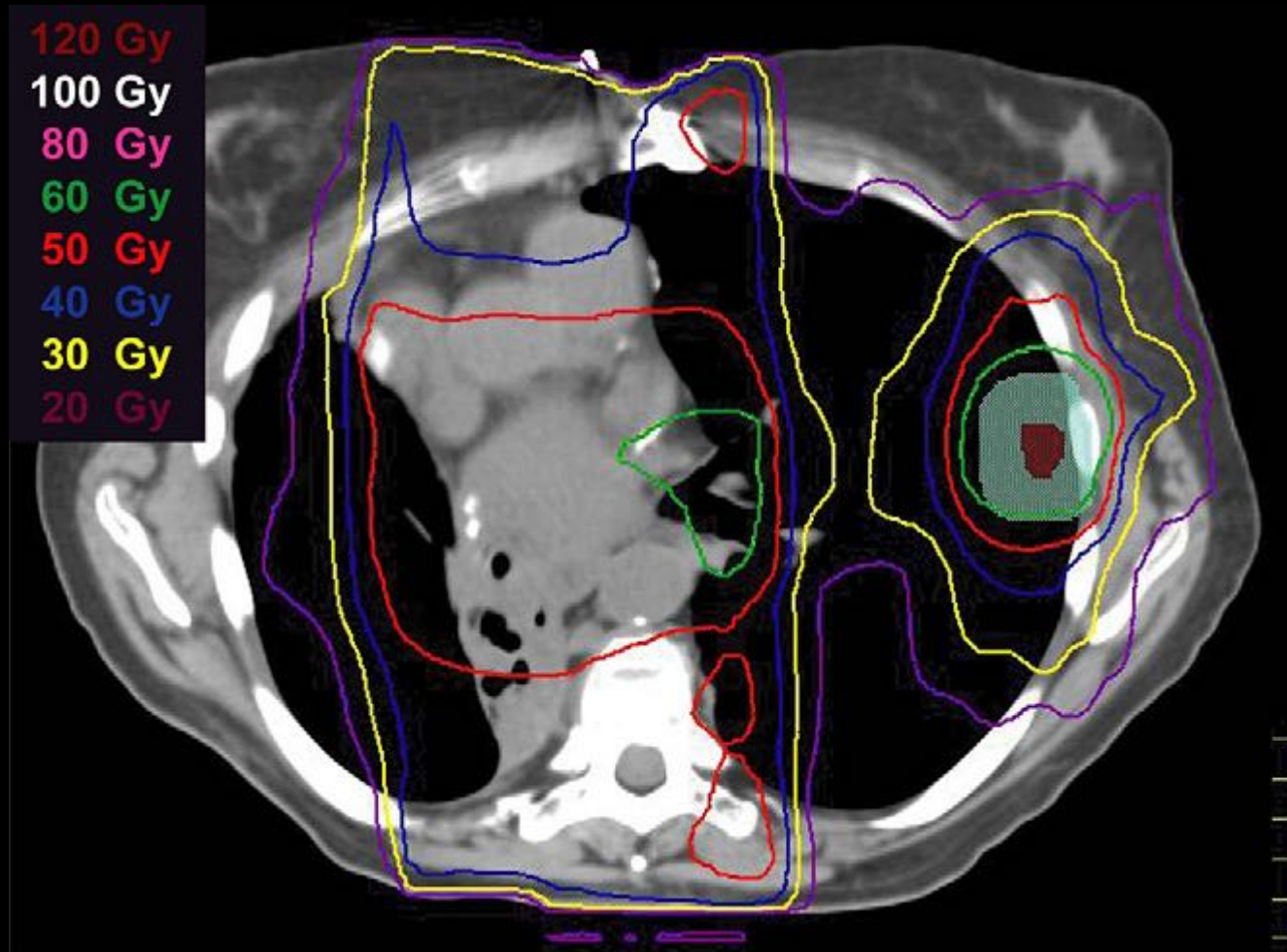
Re-irradiation  
≠  
2<sup>nd</sup> treatment in the lung



# Re-irradiation



# 2<sup>nd</sup> treatment in the lung



# 2<sup>nd</sup> treatment in the lung

- Pulmonary oligo-metastatic disease
- Second primary lung cancer

# Pulmonary oligo-metastatic disease

Authors	Pat	Target Size	Location	N.of mets	FU (mo)	Dose	LC	Toxicity
Lax	13	48 ml	Pheriph Central	Nn	8	21-66 Gy 1-3 fr	2-y 83%	Not reported
Uematsu	29	< 4 cm	Pheriph Central	Nn	11	33-76 Gy 1-8 fr	2-y 94%	Not reported
Onimaru	20	< 6 cm	Pheriph Central	1	18	48 Gy 8 fr	3-y 70-100%	1 Grade 5 esophagitis
Wulf	25	17 ml	Pheriph only	2	17	30-36 Gy 3 fr	2-y 70%	3% pneumonitis
Song	13	< 5 cm	Pheriph Central	2	14	35 Gy	2-y 87%	
Min Yoon	53		Pheriph Central	3	14	30-40 Gy 3-4 fr	70-100% crude	
Milano	50	2 cm < 7 cm	Pheriph Central	5	18	48-50 Gy 6-10 fr	3-y 90%	3% G3 pericardium
Norihisa	34		Pheriph Central	2	27	48-60 Gy 4-5 fr	2-y 90%	15% G 2-3 pneumonitis
Brown	35	< 5 cm	Pheriph Central	3	18	60 Gy 5 fr	77% crude	1 Grade 4 pneumonitis
Rusthoven	38	< 5 cm	Pheriph only	3	15	60 Gy 3 fr	2-y 96%	18% Grade 2-3

## Multi-Institutional Phase I/II Trial of Stereotactic Body Radiation Therapy for Lung Metastases

*Kyle E. Rusthoven, Brian D. Kavanagh, Stuart H. Burri, Changhu Chen, Higinia Cardenas, Mark A. Chidel, Thomas J. Pugh, Madeleine Kane, Laurie E. Gaspar, and Tracey E. Schefter*

Primary tumor	No	%
CRC	9	23
Sarcoma	7	18
RCC	7	18
Lung	5	13
Melanoma	3	8
H&N	3	8
Others	4	10

No of thoracic lesions	No
1	13
2	15
3	7
4	3
Presence of extra thoracic disease	
Yes	5
No	33



## Multi-Institutional Phase I/II Trial of Stereotactic Body Radiation Therapy for Lung Metastases

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# 8% Grade 3 toxicity

**Table 2.** Details for Patients With Grade 3 Toxicity

Primary	Dose (Gy)	Grade 3 Toxicity	Clinical Details	SBRT Details
NSCLC	60	Pneumonitis	Increased dyspnea and oxygen requirement beginning 7 months after SBRT; CT changes consistent with pneumonitis; decrease in FeV <sub>1</sub> from 1,320 mL before SBRT to 740 mL after SBRT	Lung V15 was 15.4%
Sarcoma	60	Chest wall	Left 6th rib fracture on CT appearing 25 months after SBRT; patient had chest discomfort localized to the treated area, but did not require narcotic pain medication	Left 6th rib included in PTV; max dose to rib was 76.4 Gy at the site of fracture
SCC of base of tongue	60	Skin	Confluent moist desquamation appearing 6 weeks after SBRT; moderate pain, managed with NSAIDs; improved at 4 months follow-up	30 Gy isodose extended to within 1 mm of the skin surface, corresponding to area of skin desquamation

# 2<sup>nd</sup> treatment in the lung

-Second primary lung cancer

Up to 10% risk within 5-y after tx in early stage

# STEREOTACTIC BODY RADIATION THERAPY FOR PATIENTS WITH LUNG CANCER PREVIOUSLY TREATED WITH THORACIC RADIATION

PATRICK KELLY, M.D., PH.D.,\* PETER A. BALTER, PH.D.,† NEAL REBUENO,\* HADLEY J. SHARP, M.D.,\*  
ZHONGXING LIAO, M.D.,\* RITSUKO KOMAKI, M.D.,\* AND JOE Y. CHANG, M.D., PH.D.\*

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Int. J. Radiation Oncology Biol. Phys., Vol. 78, No. 5, pp. 1387–1393, 2010

Sex, <i>n</i>	
Male	16
Female	20
Median age at time of SBRT, years (range)	67.5 (52–92)
Median KPS at time of SBRT (range)	80 (60–100)
Median follow-up, months (range)	15 (4–45)
Median interval between treatments, months (range)	22 (0–92)
Initial Stage, <i>n</i> (%)	
I–II	16 (44%)
III	17 (47%)
IV	3 (8%)
Type of initial radiation, <i>n</i> (%)	
Definitive	24 (67%)
Postoperative	7 (19%)
Palliative	5 (14%)
Method of initial radiation, <i>n</i> (%)	
Three-dimensional conformal	25 (69%)
IMRT	11 (31%)
Median dose of initial radiation, Gy (range)	61.5 (30–79.2)
Surgical history, <i>n</i> (%)	
Wedge resection	2 (6%)
Lobectomy	7 (19%)

Type of recurrence, <i>n</i> (%)	
Isolated in-field recurrence	11 (31%)
Isolated out-of-field recurrence	13 (36%)
Recurrence in setting of disseminated disease	12 (33%)

# STEREOTACTIC BODY RADIATION THERAPY FOR PATIENTS WITH LUNG CANCER PREVIOUSLY TREATED WITH THORACIC RADIATION

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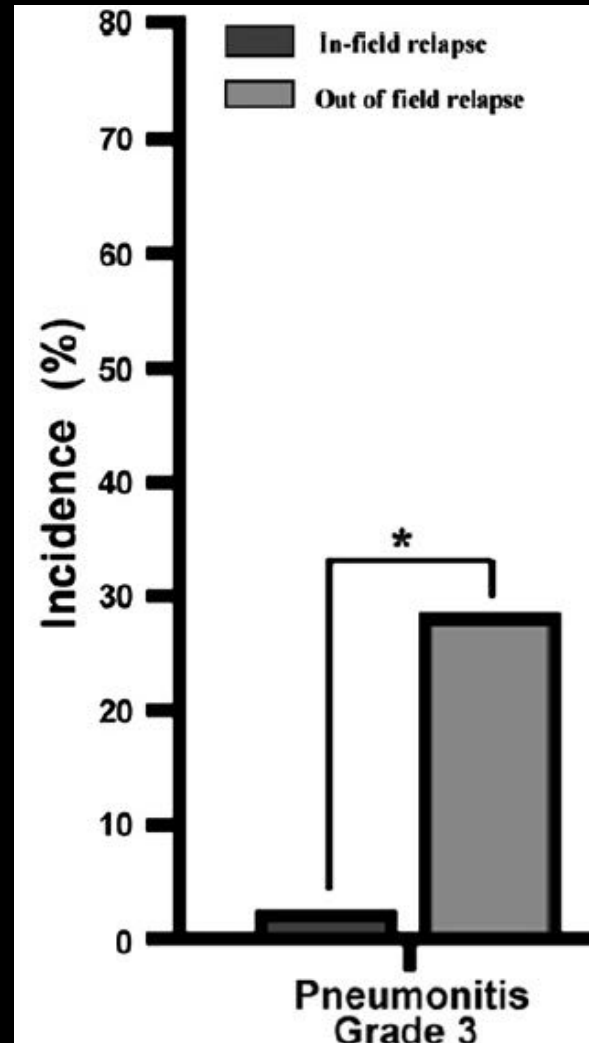
Table 3. Incidence of Grade 2 and 3 toxicity by group

	In-field relapse ( <i>n</i> = 11) <i>n</i> (%)	Out-of-field relapse ( <i>n</i> = 25) <i>n</i> (%)	Total ( <i>n</i> = 36) <i>n</i> (%)
Cough			
Grade 2	0	3 (12%)	3 (8%)
Grade 3	0	1 (4%)	1 (3%)
Pneumonitis			
Grade 2	5 (45%)	6 (24%)	11 (36%)
Grade 3	0	7 (28%)	7 (28%)
Esophagitis			
Grade 2	1 (9%)	1 (4%)	2 (6%)
Grade 3	1 (9%)	2* (8%)	3 (8%)
Skin			
Grade 2	1 (9%)	0	1 (3%)
Grade 3	2 (18%)	0	2 (6%)
Chest Wall Pain			
Not requiring narcotic	4 (36%)	1 (4%)	5 (14%)
Requiring narcotic	3 (27%)	3 (12%)	6 (17%)



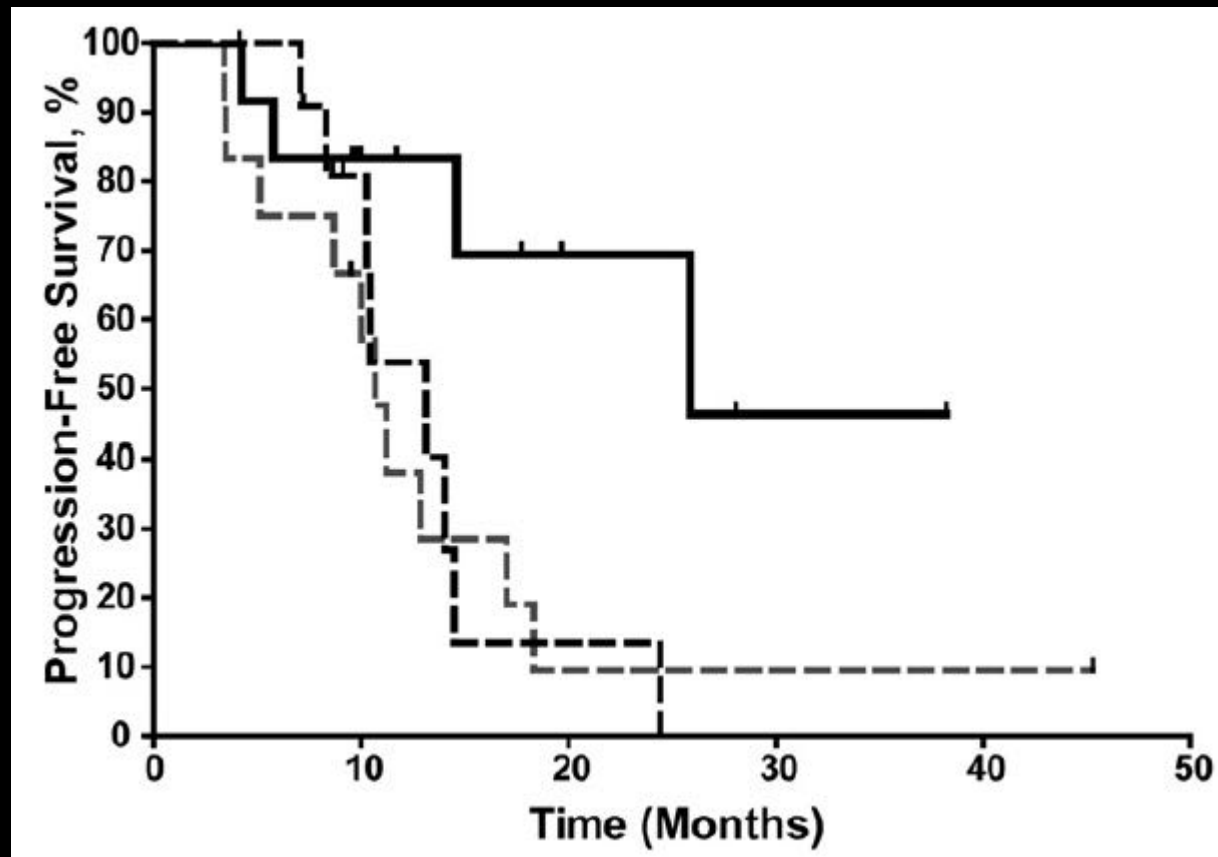
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# STEREOTACTIC BODY RADIATION THERAPY FOR PATIENTS WITH LUNG CANCER PREVIOUSLY TREATED WITH THORACIC RADIATION

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# Re-irradiation. Rationale.

## RTOG 0617 data

	60 Gy (n=217)*	74 Gy (n=207)	Cetuximab (n=237)*	No cetuximab (n=228)
<b>Local failure</b>				
Fail	77	86	95	77
1 year	16.3% (11.4-21.3)	24.8% (18.9-30.7)	22.2% (16.8-27.5)	17.6% (12.6-22.7)
2 year	30.7% (24.5-36.9)	38.6% (31.9-45.3)	38.2% (31.9-44.5)	30.7% (24.6-36.9)
HR	1.26 (0.93-1.71)	..	0.82 (0.61-1.11)	..
p value (Gray, two-sided)	0.13	..	0.20	..

# Re-irradiation. Rationale.

To improve local control

- ~~1. Dose escalation (@2 Gy/fr)~~
2. Dose per fraction escalation
3. 3D-CRT Re-irradiation
4. SBRT Re-irradiation
5. Proton therapy.



# Re-irradiation. 3D-CRT.

## THREE-DIMENSIONAL CONFORMAL RADIOTHERAPY FOR LOCOREGIONALLY RECURRENT LUNG CARCINOMA AFTER EXTERNAL BEAM IRRADIATION: A PROSPECTIVE PHASE I-II CLINICAL TRIAL

KAI-LIANG WU, M.D., GUO-LIANG JIANG, M.D., HAO QIAN, M.D., LI-JUAN WANG, M.D.,  
HUAN-JUN YANG, M.D., XIAO-LONG FU, M.D., AND SHEN ZHAO, M.D.

Department of Radiation Oncology, Cancer Hospital, Fudan University, Shanghai, China

Int. J. Radiation Oncology Biol. Phys., Vol. 57, No. 5, pp. 1345–1350, 2003

46-60 Gy re-irradiation

1-y LC: 50%

2-y OS: 20%

Median OS: 12 months

ORIGINAL ARTICLE

**Takuhito Tada · Haruyuki Fukuda · Kaoru Matsui  
Tomonori Hirashima · Masako Hosono · Yoshie Takada  
Yuichi Inoue**

**Non-small-cell lung cancer: reirradiation for loco-regional relapse previously treated with radiation therapy**

50 Gy re-irradiation

Grade 2-3 pneumonitis: 20%

1-y OS: 26%

Median OS: 7 months

# Re-irradiation. SBRT.

## Stereotactic Body Radiation Therapy for Re-irradiation of Persistent or Recurrent Non-Small Cell Lung Cancer

Marco Trovo, MD,\* Emilio Minatel, MD,\* Elena Durofil, RTT,\* Jerry Polesel, ScD,<sup>†</sup>  
Michele Avanzo, ScD,<sup>‡</sup> Tania Baresic, MD,<sup>§</sup> Alessandra Bearz, MD,<sup>||</sup>  
Alessandro Del Conte, MD,<sup>¶</sup> Giovanni Franchin, MD,\* Carlo Gobitti, MD,\*  
Imad Abu Rumeileh, MD,\* and Mauro G. Trovo, MD\*

Int J Radiation Oncol Biol Phys, Vol. 88, No. 5, pp. 1114–1119, 2014

# Stereotactic Body Radiation Therapy for Re-irradiation of Persistent or Recurrent Non-Small Cell Lung Cancer

Int J Radiation Oncol Biol Phys, Vol. 88, No. 5, pp. 1114–1119, 2014

Age median, y (range)	66 (40-88)
Sex	
Males	14
Females	3
Performance status	
0-1	9
2	8
Histology	
Squamous carcinoma	9
Adenocarcinoma	8
Initial stage	
IIIA	14
IIIB	3
Radiation technique for primary treatment	
3-dimensional conformal RT	11
Intensity modulated RT	6
Type of recurrence	
Local recurrence	13
Nodal recurrence	4
Stereotactic body RT dose	
30 Gy/5	12
30 Gy/6	5

# Stereotactic Body Radiation Therapy for Re-irradiation of Persistent or Recurrent Non-Small Cell Lung Cancer

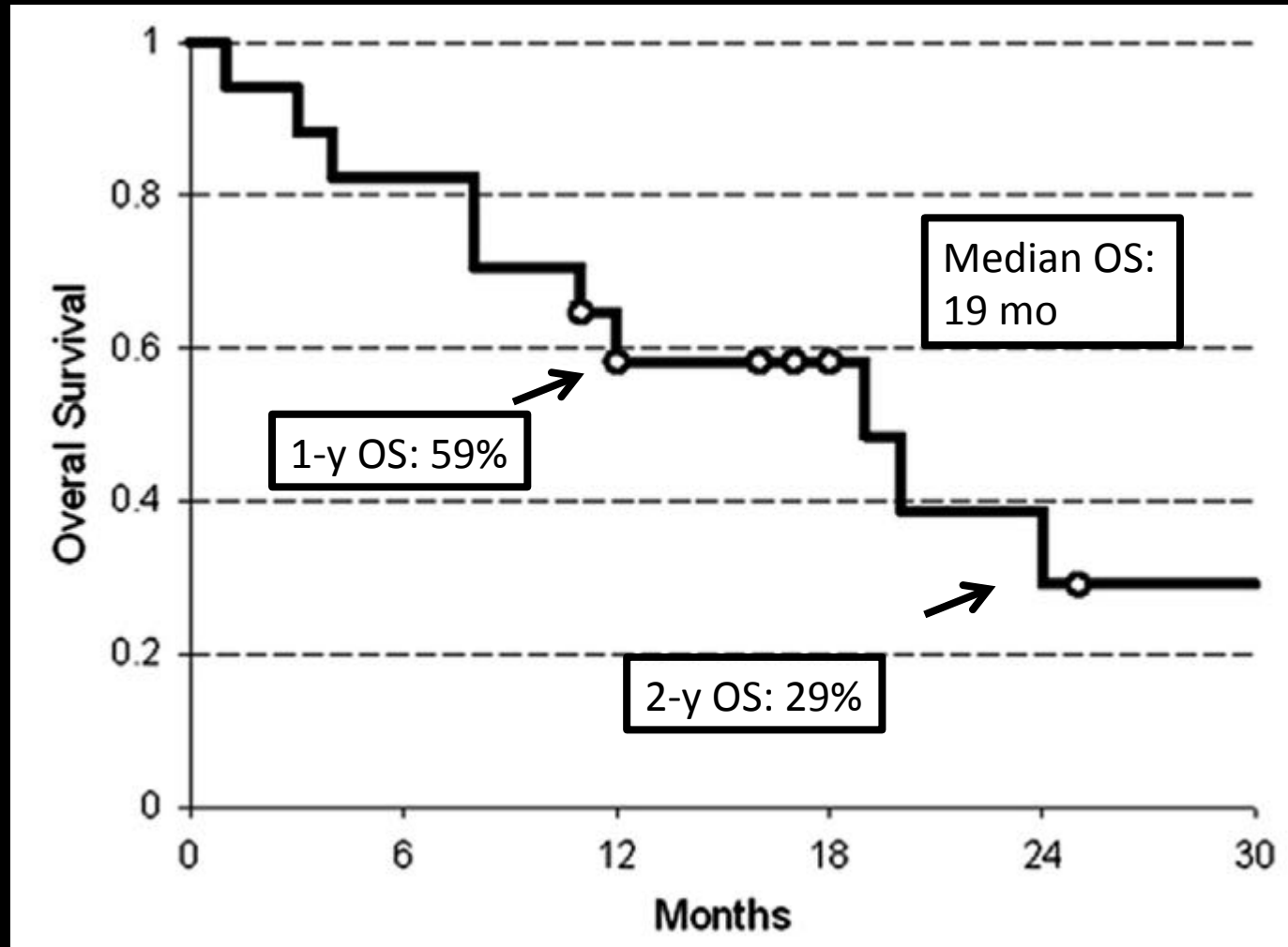
Int J Radiation Oncol Biol Phys, Vol. 88, No. 5, pp. 1114–1119, 2014

Median FU	18 mo (range, 4-57 mo)
Local failure	N=2
1-y LC	86%
Distant failure	N= 8
1-y DMFS	47%



# Stereotactic Body Radiation Therapy for Re-irradiation of Persistent or Recurrent Non-Small Cell Lung Cancer

Int J Radiation Oncol Biol Phys, Vol. 88, No. 5, pp. 1114–1119, 2014



# Stereotactic Body Radiation Therapy for Re-irradiation of Persistent or Recurrent Non-Small Cell Lung Cancer

**Grade 3 pneumonitis N=4 (23%)**

**Grade 5 toxicity N=2 (12%)**

**Table 2** Dosimetric parameters (mean values) and clinical pneumonitis

Parameter	CP (-) (n=13)	CP (+) (n=4)	P
<b>Heart</b>			
Mean dose	1.2 Gy	2.3 Gy	NS
Dmax	13.3 Gy	27.0 Gy	.05
D5	3.9 Gy	10.2 Gy	.05
D10	2.8 Gy	7.1 Gy	.05
<b>Tracheobronchial tree</b>			
Mean dose	6.1 Gy	8.4 Gy	NS
Dmax	24.4 Gy	28.4 Gy	NS
D5	20.3 Gy	25.8 Gy	NS
D10	15.4 Gy	22.5 Gy	NS
<b>Total lung</b>			
Mean dose	2.5 Gy	3.3 Gy	NS
V40%	4.8%	6.8%	NS
V30%	7.8%	10.0%	NS
V20%	12.2%	15.8%	NS
V15%	15.6%	21.2%	NS
V10%	21.9%	28.8%	NS
V5%	34.8%	42.6%	NS
<b>Ipsilateral lung</b>			
Mean dose	4.3 Gy	6.2 Gy	NS
V40%	11.4%	17.4%	NS
V30%	17.4%	26.6%	NS
V20%	25.8%	38.0%	NS
V15%	32.0%	44.2%	NS
V10%	37.8%	49.6%	NS
V5%	44.8%	56.2%	NS
<b>Contralateral lung</b>			
Mean dose	1.1 Gy	1.5 Gy	NS
V40%	0.2%	0%	NS
V30%	0.6%	0%	NS
V20%	1.7%	2.0%	NS
V15%	3.8%	6.2%	NS
V10%	10.9%	16.0%	NS
V5%	27.8%	35.6%	NS

# Non-traditional predictive factors of lung toxicity

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*Acta Oncologica*, 2011; 50: 51–60

**informa**  
healthcare

## ORIGINAL ARTICLE

### **Heart irradiation as a risk factor for radiation pneumonitis**

ELLEN X. HUANG<sup>1</sup>, ANDREW J. HOPE<sup>2</sup>, PATRICIA E. LINDSAY<sup>2</sup>, MARCO TROVO<sup>3</sup>,  
ISSAM EL NAQA<sup>1</sup>, JOSEPH O. DEASY<sup>1</sup> & JEFFREY D. BRADLEY<sup>1</sup>

<sup>1</sup>*Department of Radiation Oncology, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, Missouri, USA,* <sup>2</sup>*Princess Margaret Hospital, Toronto, ON, Canada* and <sup>3</sup>*National Cancer Institute, Aviano, Italy*



# Non-Traditional predictive factors of lung toxicity

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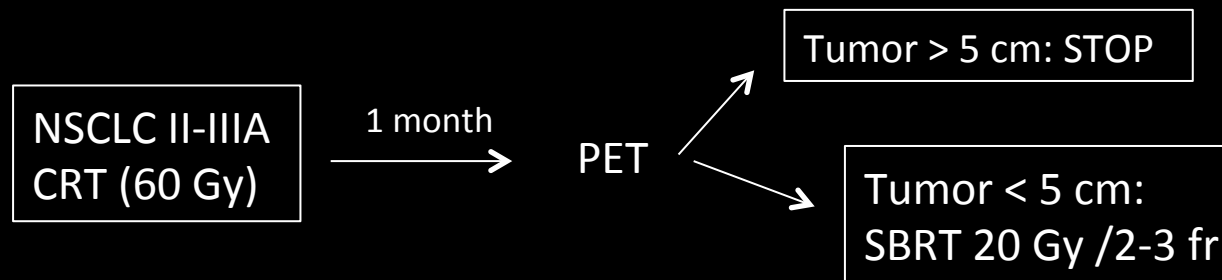
## *Highest univariate correlations*

Variable	Spearman Corr.	Significance
D5_Heart	0.256	<0.0002
D10_Heart	0.24	<0.0003
V70_heart	0.239	<0.0003
gEUD_Heart (a=10)	0.249	<0.0001
Maximum Heart Dose	0.227	<0.0006
Superior-Inferior position of GTV	0.219	<0.0008

# Stereotactic Body Radiation Therapy Can Be Used Safely to Boost Residual Disease in Locally Advanced Non-Small Cell Lung Cancer: A Prospective Study

Jonathan Feddock, MD,<sup>\*</sup> Susanne M. Arnold, MD,<sup>\*,†</sup> Brent J. Shelton, PhD,<sup>‡</sup> Partha Sinha, MD,<sup>§</sup> Gary Conrad, MD,<sup>§</sup> Li Chen, PhD,<sup>‡</sup> John Rinehart, MD,<sup>†</sup> and Ronald C. McGarry, MD, PhD<sup>\*</sup>

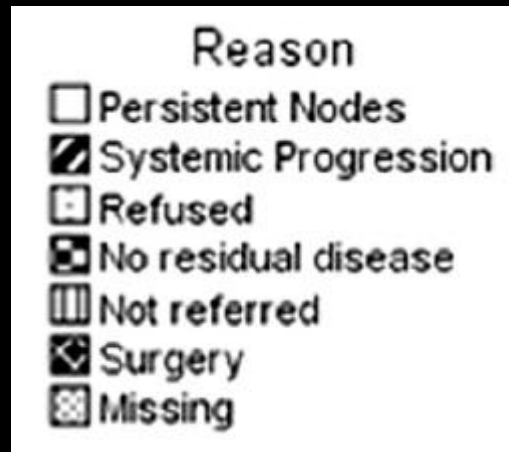
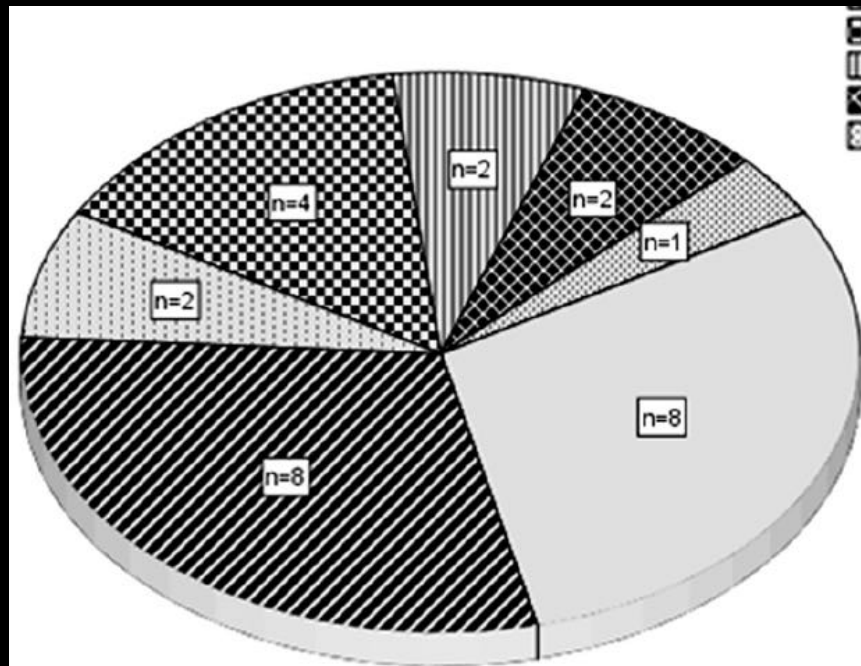
*Departments of <sup>\*</sup>Radiation Medicine, <sup>†</sup>Medical Oncology, <sup>‡</sup>Biostatistics, and <sup>§</sup>Radiology, University of Kentucky, Lexington, Kentucky*



# Stereotactic Body Radiation Therapy Can Be Used Safely to Boost Residual Disease in Locally Advanced Non-Small Cell Lung Cancer: A Prospective Study

Jonathan Feddock, MD,<sup>\*</sup> Susanne M. Arnold, MD,<sup>\*,†</sup> Brent J. Shelton, PhD,<sup>‡</sup> Partha Sinha, MD,<sup>§</sup> Gary Conrad, MD,<sup>§</sup> Li Chen, PhD,<sup>‡</sup> John Rinehart, MD,<sup>†</sup> and Ronald C. McGarry, MD, PhD<sup>\*</sup>

Departments of <sup>\*</sup>Radiation Medicine, <sup>†</sup>Medical Oncology, <sup>‡</sup>Biostatistics, and <sup>§</sup>Radiology, University of Kentucky, Lexington, Kentucky

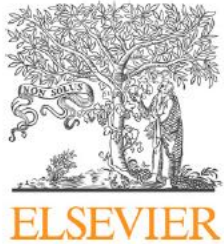


# Stereotactic Body Radiation Therapy Can Be Used Safely to Boost Residual Disease in Locally Advanced Non-Small Cell Lung Cancer: A Prospective Study

**Table 4** Significant associations for development of radiation pneumonitis (RP)

Patient factor	Developed RP* (n=5)	Did not develop RP (n=30)	<i>P</i>
Mean age (y)	70.8	61.3	.0147
Sex			1.0000
Male	3 (16)	16	
Female	2 (13)	14	
Smoking status			.0505
Current	0	16	
Former	5 (28)	13	
Never	0	1	
Mean pack-years <sup>†</sup>	45	57.1	.4756
History of COPD			.1567
Yes	5 (21)	19	
No	0	11	
Location of tumor			
Right	5 (21)	19	.1567
Left	0	11	
Medial	2 (12)	15	1.0000
Peripheral	3 (17)	15	
Treatment scheme			1.0000
10 Gy × 2	4 (14)	24	
6.5 Gy × 3	1 (14)	6	
CRT dosimetry <sup>‡</sup>			
MLD (cGy)	17.6	12.6	.0295
V20 (%)	29.9	24.6	.1126
SBRT boost dosimetry <sup>§</sup>			
MLD (cGy)	199	186	.7324
V2.5 (%)	22.8	21.9	.8424
V5 (%)	11.9	11.3	.8129
V10 (%)	4.95	4.18	.5443
V20 (%)	1.95	1.43	.5945
Mean PTV size (cm <sup>3</sup> )	67.4	61.3	.7188

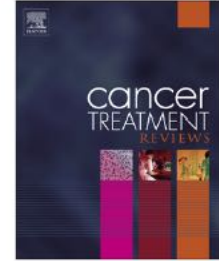




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## Cancer Treatment Reviews

journal homepage: [www.elsevierhealth.com/journals/ctrv](http://www.elsevierhealth.com/journals/ctrv)

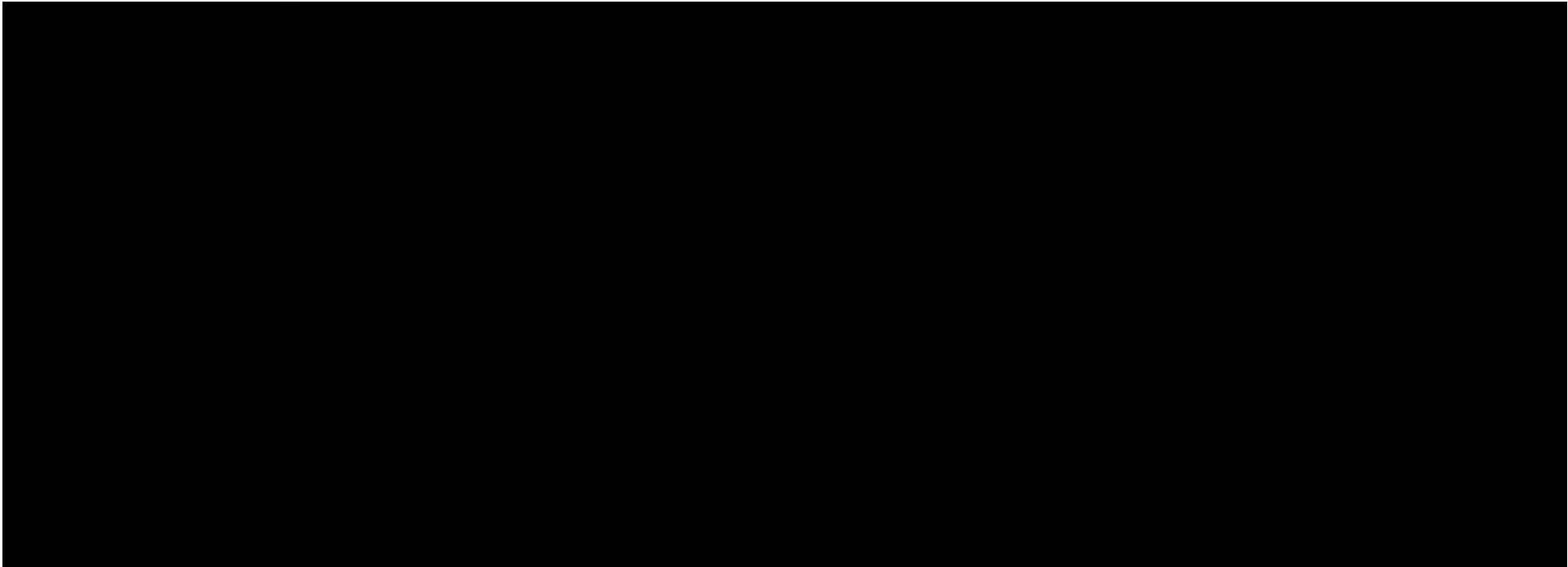


Anti-Tumour Treatment

### Available evidence on re-irradiation with stereotactic ablative radiotherapy following high-dose previous thoracic radiotherapy for lung malignancies



Berardino De Bari <sup>a</sup>, Andrea Riccardo Filippi <sup>b,\*</sup>, Rosario Mazzola <sup>c</sup>, Pierluigi Bonomo <sup>d</sup>, Marco Trovò <sup>e</sup>, Lorenzo Livi <sup>d</sup>, Filippo Alongi <sup>f</sup>



**Table 1**

Patients' characteristics of selected studies.

Author publication year [references]	Years of enrollment	Number of patients	Tumor types (no. of patients)	Infield/outfield relapses (no. of patients)	Median target volume (cc, range)	Median RT dose of the primary treatment	Interval between primary and salvage treatment	Salvage SBRT schedule
Coon et al. (2008) [23]	2005–2007	12	Locally recurrent or progressive lung cancer (NA)	NA	14 (3.4–128)	NA	NA	60 Gy/3 fx
Kelly et al. (2010) [24]	2004–2008	36	Primary lung cancer (36)	11/25*	NA	61.5 Gy (range, 30–79)	22 months	50 Gy/4fx 40 Gy/5 fx
Seung et al. (2011) [25]	2009–2010	8	Primary lung cancer (8)	NA	NA	50–68 Gy (1.8–2.5 Gy/fractions)	36 months	40 Gy/5 fx 48 Gy/4fx 50 Gy/5 fx 60 Gy/3 fx
Peulen et al. (2011) [26]	1994–2004	29	Primary (6) and lung metastases (23)	NA	(76, 16–355)	30–45 Gy/2–3 fx 40 Gy/4 fx	14 months	30–45 Gy/2–3fx 40 Gy/5 fx
Trakul et al. (2012) [27]	2004–2010	15	Primary (12) and lung metastases (5)**	17/0**	(31.6, 7.4–119.7)	Not specified	16 months	20 Gy/1fx 40 Gy/5 fx
Liu et al. (2012) [28]	2004–2010	72	Primary (10) and lung metastases (62)	19/53	NA	63 Gy (range, 30–79)	21 months	50 Gy/4fx
Valakh et al. (2013) [29]	2006–2011	9	Primary (8) and lung metastases (1)	3/6	(22.2 +/- 24.5)	60 Gy (range, 30–60) in 3–5 fx	NR	60 Gy (30–60)/3–5 fx
Meijneke et al. (2013) [30]	2005–2012	20	Primary (17) and Lung metastases (3)	0/20	NA	60 Gy/3fx 60–50 Gy/20–25 fx	11 months	60 Gy/5 fx 50 Gy/5 fx
Reyngold et al. (2013) [31]	2004–2011	39	Primary (17) and lung metastases (22)	22/17	(67, 17–473)	61 Gy (range, 30–79)	37 months	48 Gy/4 fx
Trovò et al. (2014) [32]	Not specified	17	Primary lung cancer (17)	17/0	NA	50–60 Gy/20–30 fx	18 months	30 Gy/5–6 fx
Hearn et al. (2014) [33]	2004–2012	10	Primary lung cancer (10)	NA	NA	50 Gy/5 fx 30 or 34 Gy/1 fx	15 months	50 Gy/5 fx 60 Gy/3 fx
Kilburn et al. (2014) [34]	2001–2012	33	Primary (29) and lung metastases (4)***	NA	NA	66 Gy (range, 45–80)	18 months	50 Gy/5 fx 20 Gy/1 fx

**Table 2**

Clinical outcomes reported by selected studies.

Author publication year [references]	Follow-up (after salvage treatment, months)	Local control	Overall survival	Severe acute and late toxicity rates
Coon et al. (2008) [23]	12	1-Year: 92%	1-Year: 81%	NA
Kelly et al. (2010) [24]	15	2-Years: 92%	2-Years: 59%	G3 pneumonitis: 28% G3 Esophagitis: 4% Chest wall pain: 31%
Seung et al. (2011) [25]	18	At 18 months: 86%	At 18 months: 87.5%	None
Peulen et al. (2011) [26]	12	1-Year: 52% 2-Years: 43%	1-Year: 59%	G3 pneumonitis: 30% G4-5: 13% (central lesion)
Trakul et al. (2012) [27]	15	1-Year: 65%	1-Year: 80%	None
Liu et al. (2012) [28]	16	1-Year: 95%	2-Years: 74%	G3 pneumonitis: 19% 1 pt: G5 pneumonitis
Valakh et al. (2013) [29]	22	2-Years: 75%	2-Years: 69%	Late G3 pneumonitis: 22% Late G3 chest wall pain: 11%
Meijneke et al. (2013) [30]	12	1-Years: 75% 2-Years: 50%	1-Years: 67% 2-Years: 33%	None
Reyngold et al. (2013) [31]	12	1-Year: 77% 2-Years: 64%	22 months (median)	G3 pneumonitis: 5% G4 skin:25%
Trovò et al. (2014) [32]	18	1-Year: 86%	1-Year: 59% 2-Years: 29%	G3 pneumonitis: 17% -1 pt: G5 pneumonitis -1 pt: G5 bleeding
Hearn et al. (2014) [33]	14	Not specified*	Four patients presented a local failure at a median of 9.9 months.	No G3-5 toxicity
Kilburn et al. (2014) [34]	11	2-Years: 67%	21 months (median)	Late G3 pneumonitis: 3% 1 pt: G5 aorto-esophageal fistula

Is SBRT boost/re-irradiation the  
“cutting edge” of research in NSCLC?



Hepel et. al. ASTRO 2015

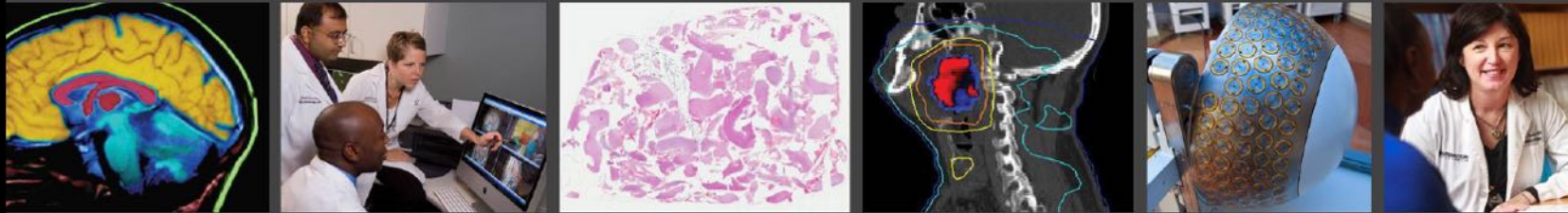
Platinum-based chemoradiation to a dose of 50.4 Gy in 28 fractions and had primary and nodal volumes appropriate for SBRT boost

Patient Cohort	1cm <sup>3</sup> PBV [SBRT] (Gy)	4cm <sup>3</sup> PBV [SBRT] (Gy)	1cm <sup>3</sup> PBV [EBRT +SBRT] (Gy)	4cm <sup>3</sup> PBV [EBRT +SBRT] (Gy)
A - 8Gy x2	13.7	9.4	65.9	60.4
B- 10Gy x2	17.0	10.5	67.4	49.5
C- 12Gy x2	18.2	9.2	66.6	45.8
D- 14Gy x2	21.2	12.5	72.3	60.5
Pt #9 - PBV Hemorrhage (Gr 5)	26.3	20.3	79.5	73.5

The actuarial LRC at 1-yr was 75%. Locoregional control was 67% at <24 Gy and 100% at ≥24 Gy ( $P=0.1$ ).

# Is SBRT boost/re-irradiation the “cutting edge” of research in NSCLC?

- Difficult to assess efficacy
- Toxicity profile seems acceptable in some series, unacceptable in others
- Difficult to design prospective trials
- Highly individualized risk-benefit decision
- Reliable normal tissue tolerance parameters remain to be prospectively defined



**RTOG 1308: Phase III Randomized Trial  
Comparing Overall Survival after Photon  
versus Proton Radiochemotherapy for  
Inoperable Stage II-III B NSCLC**

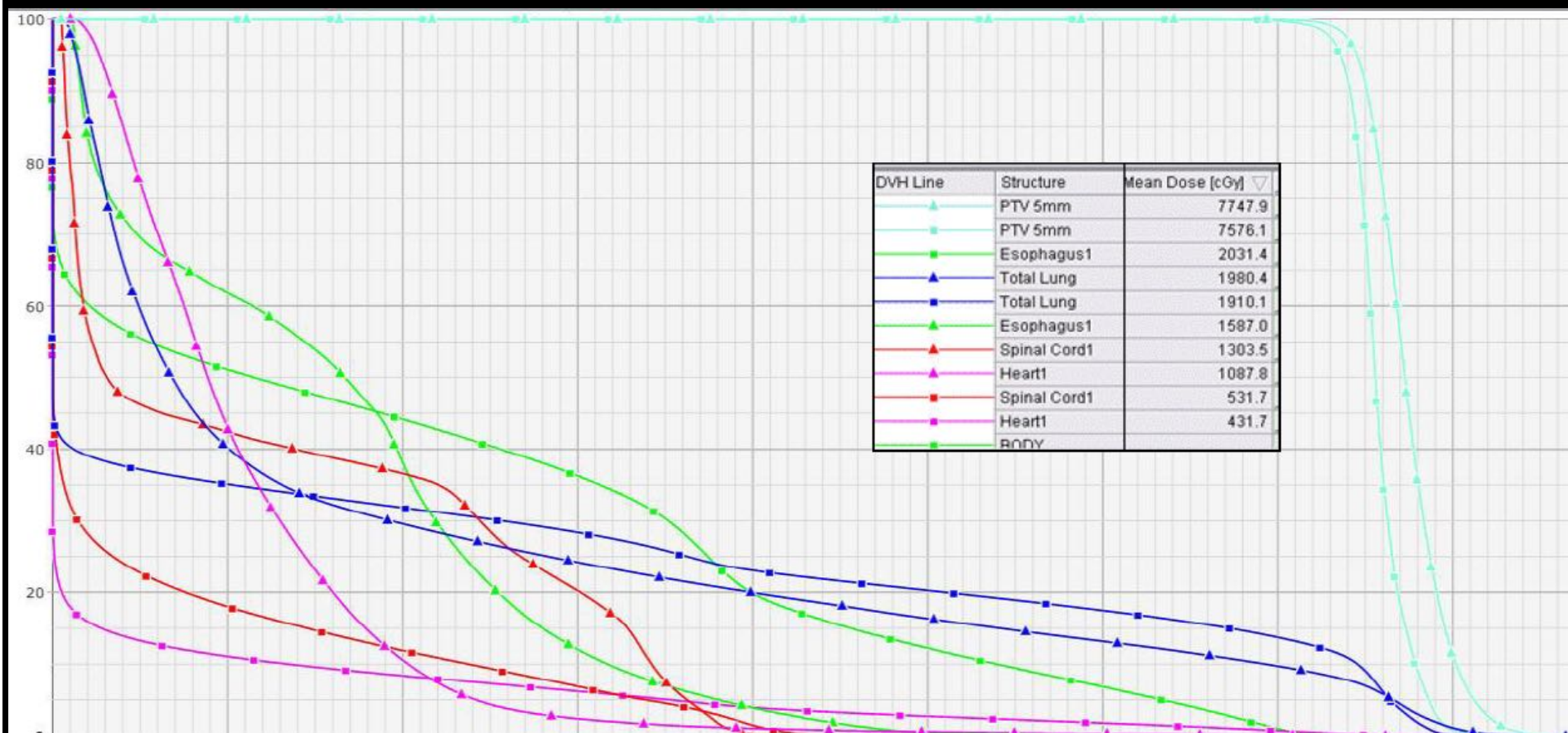
**PI: Zhongxing Liao**

# RTOG 1308 Schema

S T R A T I F Y	Stage	R A N D O M I Z E	<p>Arm 1: Photon dose—70 Gy*, at 2 Gy (RBE) once daily plus platinum-based doublet chemotherapy**</p> <p>Arm 2: Proton dose—70 Gy (RBE), at 2 Gy once daily plus platinum-based doublet chemotherapy**</p>	<p>Both Arms: Consolidation chemotherapy x 2 cycles required for patients who receive concurrent carboplatin and paclitaxel***</p>
	<p>1.II</p> <p>2.IIIA</p> <p>3.IIIB</p> <p>Histology</p> <p>1.Squamous</p> <p>2.Non-Squamous</p> <p>Concurrent Chemotherapy Doublet Type</p> <p>1.Carboplatin/paclitaxel</p> <p>2.Cisplatin/etoposide</p>			

# Representative Plans

■ Protons  
▲ IMRT



*grazie per l'attenzione!*

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