



Università degli Studi di Torino
**Dipartimento di Discipline Medico-
Chirurgiche**
Sezione di Radiodiagnostica

Direttore: Prof. Giovanni Gandini

AOU S. Giovanni Battista di Torino
**Dipartimento di Diagnostica per
Immagini**
S.C.D.U.- Radiologia 4



Diagnostica per Immagini e Trattamenti del Nodulo Polmonare Solitario



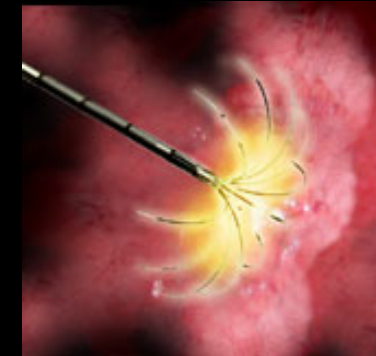
Associazione Italiana Radioterapia Oncologica

XXI CONGRESSO NAZIONALE AIRO
Genova, 19-22 novembre 2011
Porto Antico di Genova
Cento Congressi

Presidente AIRO
Enza Barbieri

Presidente del Congresso
Renzo Corvò

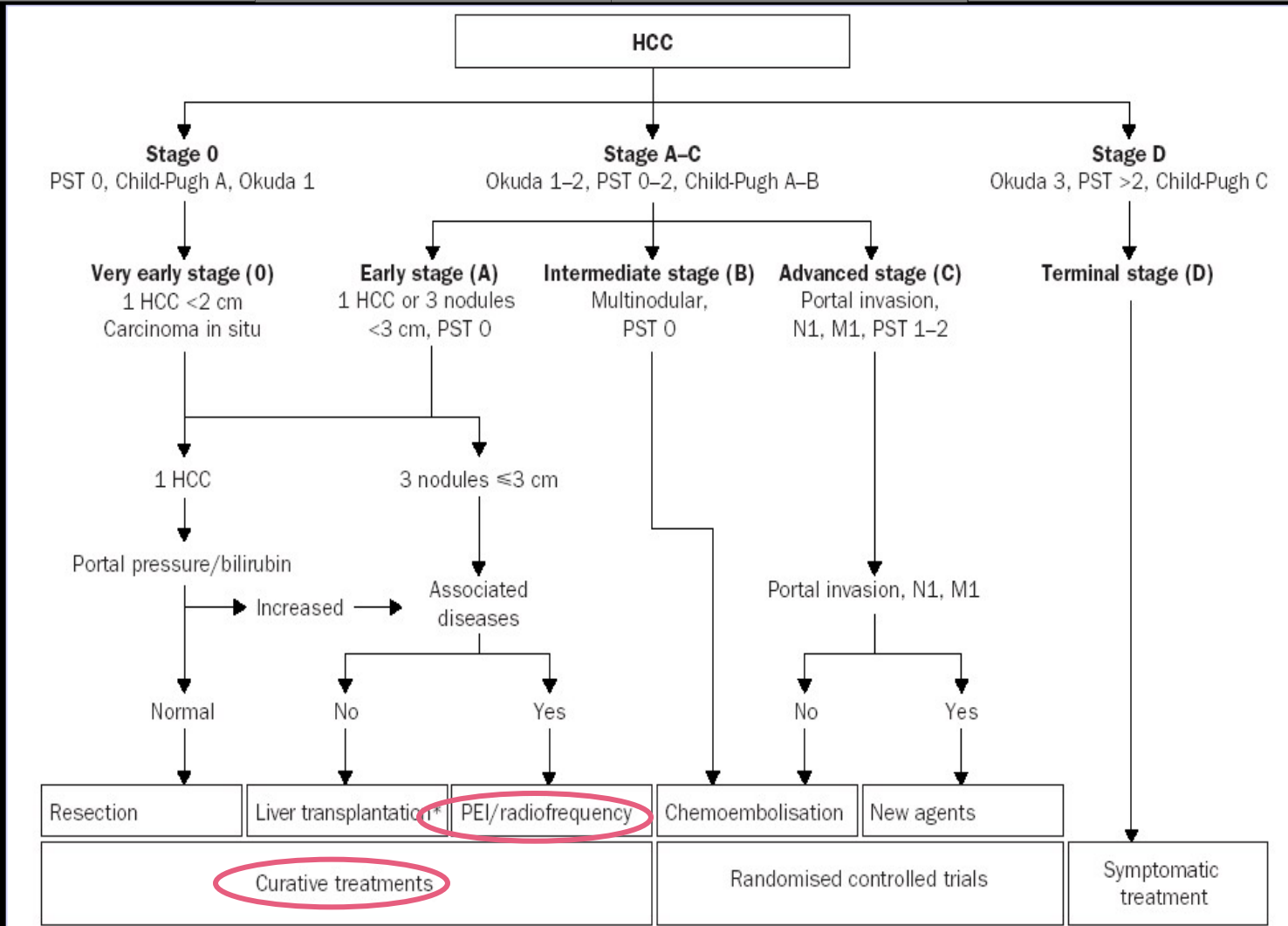
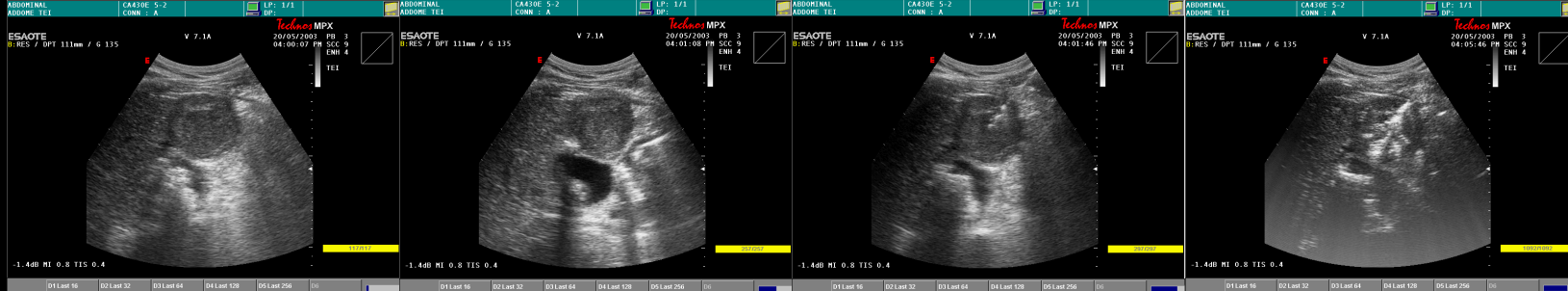
Coordinatore Scientifico
Umberto Ricardi



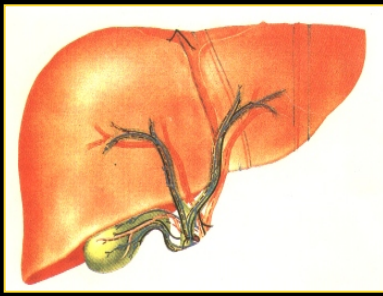
Trattamenti Ablativi di Radiologia Interventistica

Paolo Fonio

Genova, 21 novembre 2011



BCLC Staging System - Endorsed by EASL and AASLD in 2005



Neoplasie
epatiche

HCC

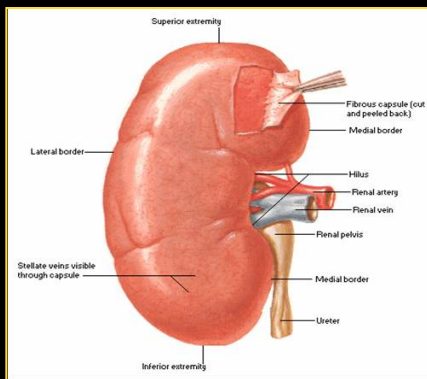
Mts Colon-retto

Cancer Imaging, 2008 Oct 4;8 Spec No A:S1-5.

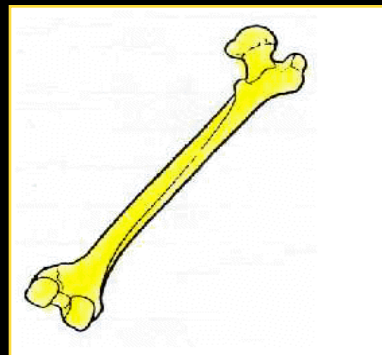
Tumour ablation: current role in the liver, kidney, lung and bone.

Gillams A.

Imaging Department, University College Hospital, 235 Euston Road, London, UK. a.gillams@medphys.ucl.ac.uk



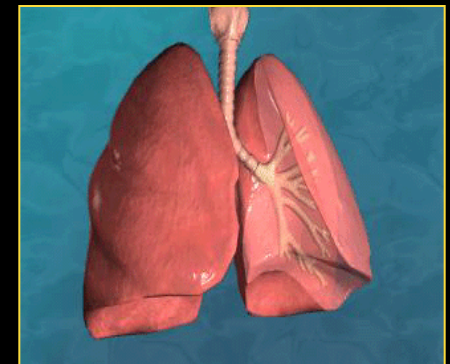
Neoplasie
renali



Neoplasie
ossee

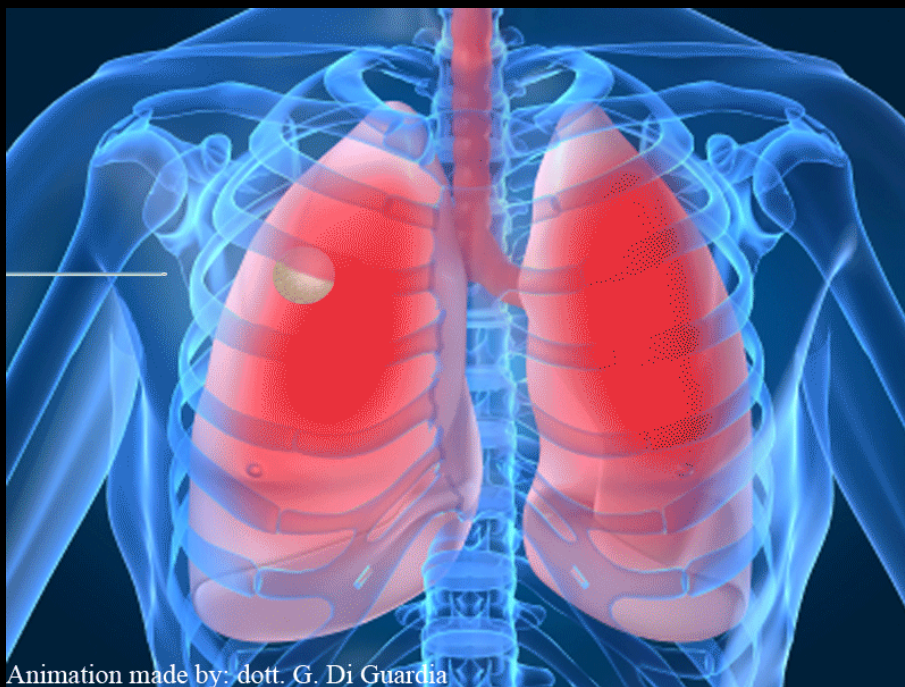
Osteoma
osteoid

Metastasi



Neoplasie
Polmonari

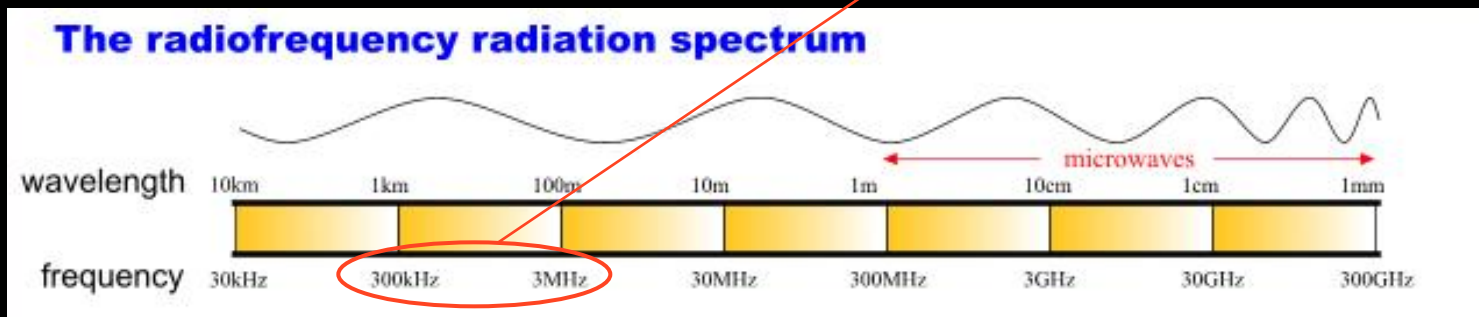
Opzione terapeutica nel trattamento di tumori primitivi e secondari basata sull'impiego dell'ipertermia interstiziale ottenuta mediante onde a radiofrequenza



Effetto calore tessuti biologici

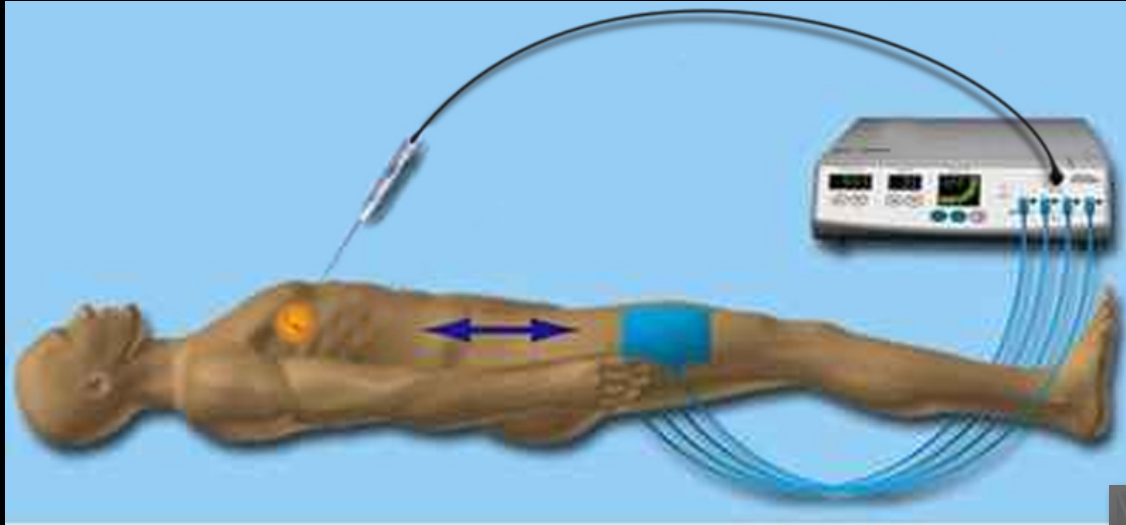
43°- 45° danno reversibile
 46°- 60° necrosi coagulativa
 50°-52° morte cellulare in 4-6 minuti
 100° fenomeni di ebollizione,
 evaporazione e carbonizzazione

ONDE a MEDIA FREQUENZA
 fra 370-500 KHz
 (mai superiori a 900 KHz)



TECNICA

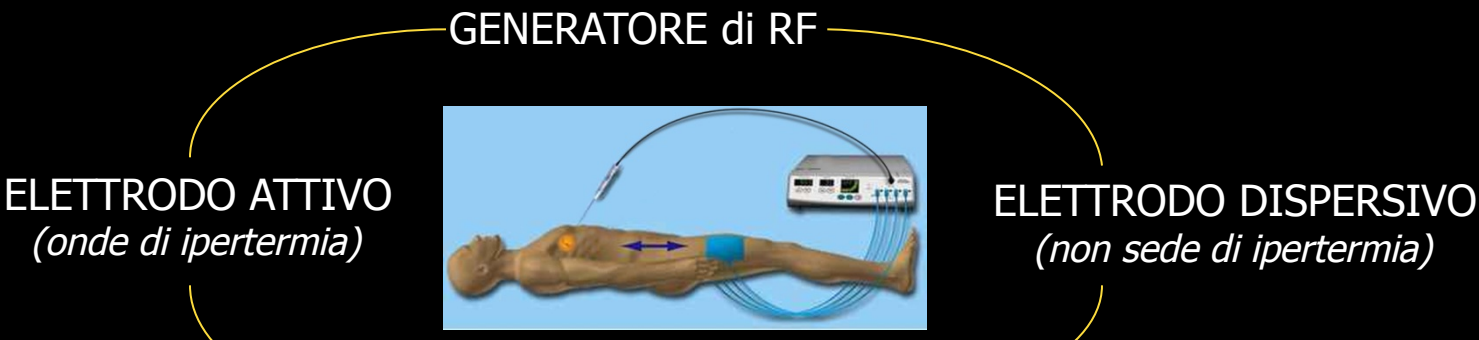
(sistema "monopolare")



- Generatore di radiofrequenze (460-500 kHz)
- Ago-elettrodo attivo
- Placca-elettrodo dispersivo

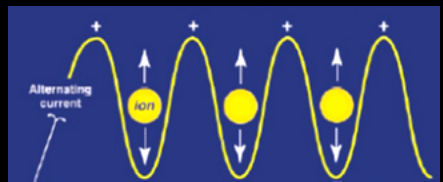
TECNICA: *meccanismo d'azione*

RFA



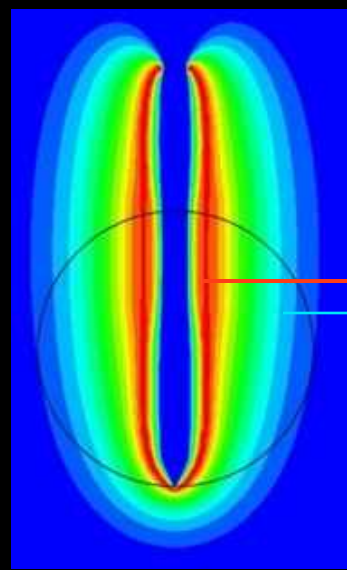
Il volume di necrosi dipende dalla distribuzione della temperatura all'interno della lesione

AGITAZIONE IONICA-RISCALDAMENTO



CALORE

LESIONE TERMICA

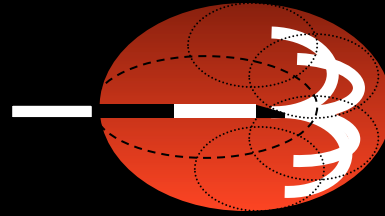


Simulazione al computer
Rosso = 90°
Azzurro = 50°

RF

AGO a "UNCINI"

15G

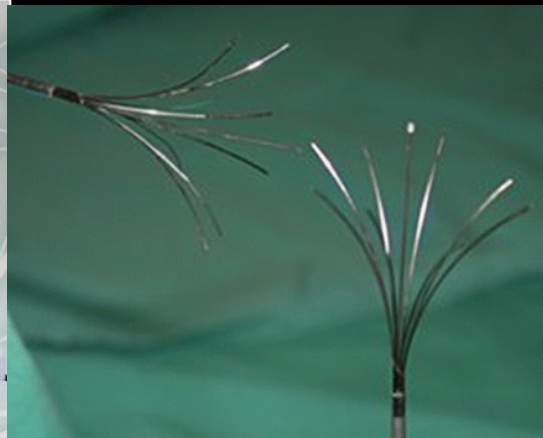


2 - 5 cm

RFA

RITA Medical Systems®

Starbust

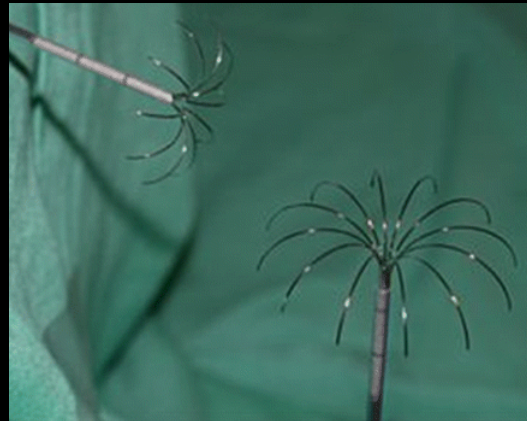


Radiotherapeutics®

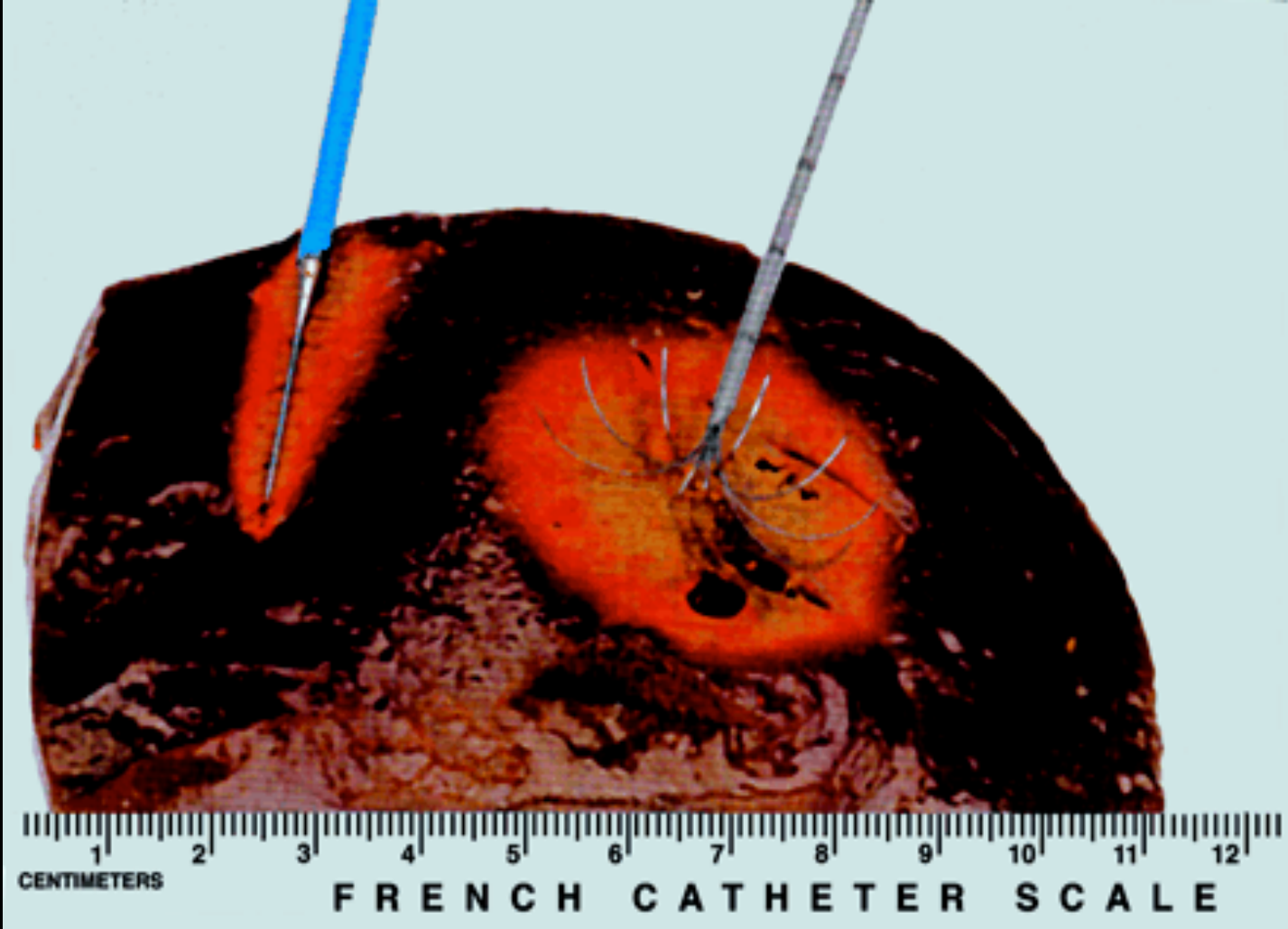
uncini di acciaio

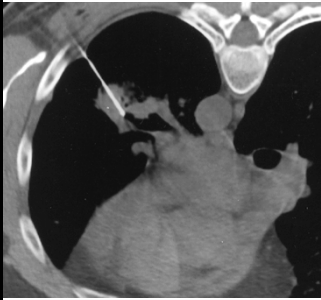


Le Veen Boston Scientific®



VANTAGGIO





Technical Innovation

Percutaneous Radiofrequency Ablation of Malignancies in the Lung

Damian E. Dupuy¹, Ronald J. Zagoria², Wallace Akerley¹, William W. Mayo-Smith¹, Peter V. Kavanagh², Howard Safran³

La Radiologia Medica - Radiol Med 105: 237-242, 2003
Edizioni Minerva Medica - Torino

Termoablazione percutanea ecoguidata di metastasi polmonare
Percutaneous US-guided thermal ablation of a lung metastasis

Andrea VELTRI - Alberto BALDERI - Valeria MALFITANA - Federica MAROCCO
Barbara PUGLISI - Giovanni GANDINI

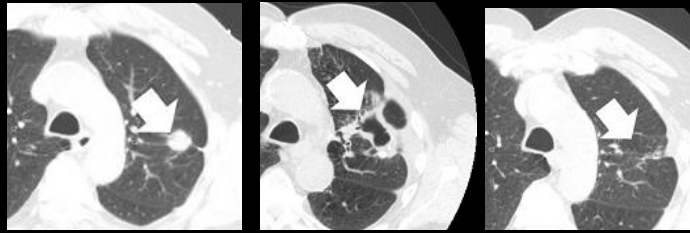
Anticancer Research

Pulmonary Radiofrequency Ablation – An International Study Survey

KARIN STEINKE¹, PATRICK E. SEWELL², DAMIEN DUPUY³, RICCARDO LENCIONI⁴,
THOMAS HELMBERGER⁵, STEPHEN T. KEE⁶, AUGUSTINUS L. JACOB⁷,
DEREK W. GLENN⁸, JULIE KING¹ and DAVID L. MORRIS¹

493 pazienti trattati
in 7 centri

RFA of both primary and secondary pulmonary tumors is a safe treatment option in a selected patient group. Future work is necessary to further investigate the long-term results and prognostic factors to assess patients who benefit most from this local tumor control with very low morbidity and mortality, much shorter hospital stays compared to surgical procedures, lower costs (an issue not covered in this paper) and, last but not least, a gain in the patients' life quality.



THE LANCET **Oncology**

Volume 9, Issue 7, July 2008, Pages 621-628

**Response to radiofrequency ablation of pulmonary tumours:
a prospective, intention-to-treat, multicentre clinical trial
(the RAPTURE study)**

*Riccardo Lencioni, Laura Crocetti, Roberto Cloni, Robert Suh, Derek Glenn, Daniele Regge, Thomas Helmberger, Alice R Gillams, Andrea Frilling,
Marcello Ambrogi, Carlo Bartolozzi, Alfredo Musci*

Radiofrequency Ablation of Pulmonary Tumors Response Evaluation (RAPTURE) Trial

¹ *University of Pisa, Italy*

² *UCLA, Los Angeles, CA, USA*

³ *Middlesex Hospital, London, UK*

⁴ *University Hospital, München, Germany*

⁵ *University Hospital, Essen, Germany*

⁶ *National Cancer Institute, Candiolo, Italy*

⁷ *Saint George Hospital, Sydney, Australia*

Criteri di inclusione

- Pazienti non resecabili, NSCLC o mts (biopsia)
- n° lesioni ≤ 3 / polmone, diametro lesione ≤ 3.5 cm
- Lesioni > 1 cm da grossi vasi/vie aeree
- Piastrine $> 100,000$ / mm^3 , INR ≤ 1.5

Criteri di esclusione

- Pregressa pneumonectomia
- Performance status > 2

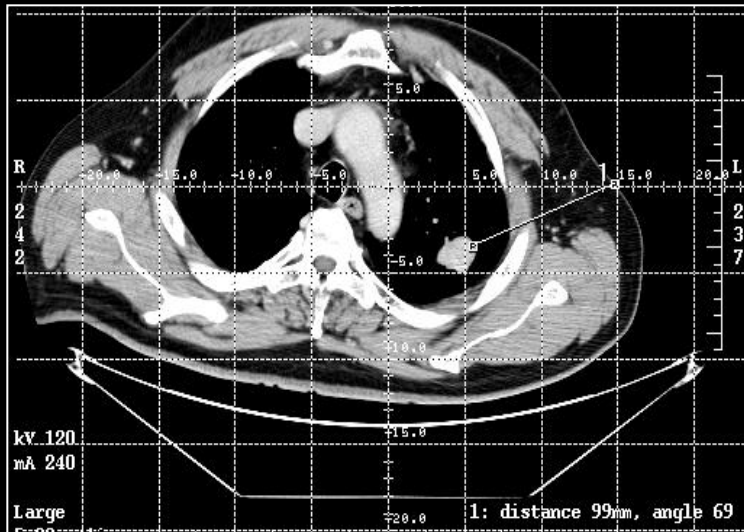
RAPTURE: *caratteristiche pazienti*

Parametri	NSCLC (<i>n</i> = 33)*	CRC (<i>n</i> = 53)	Other (<i>n</i> = 20)	Overall (<i>n</i> = 106)
Sesso (<i>F</i> : <i>M</i>)	8 : 25	16 : 37	12 : 8	36 : 70
Età (<i>median</i>)	67.0	63.0	70.0	66.0
n° lesioni	38	119	26	183
Totale	1.2 ± 0.4	2.2 ± 1.6	1.3 ± 0.7	1.7 ± 1.3
Media ± SD				
Diam. lesioni (cm)	2.2 ± 0.7	1.4 ± 0.7	2.1 ± 0.7	1.7 ± 0.8
Media ± SD				

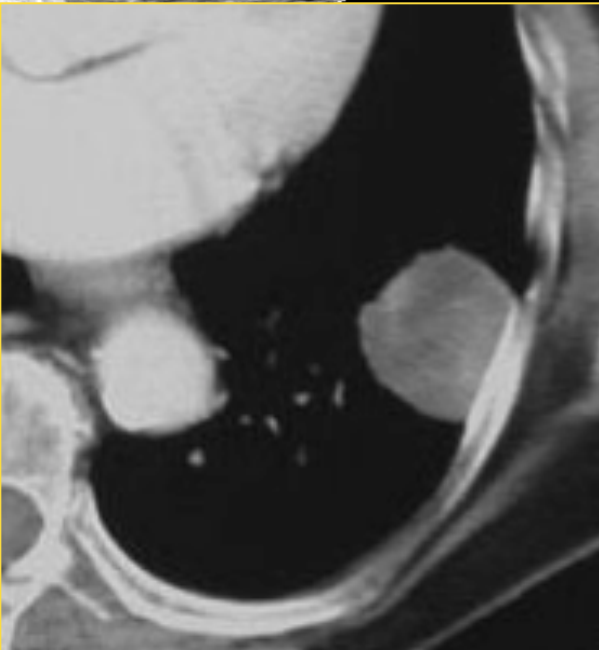
* Stadio I, n=16; stadio II-IV, n=17

RAPTURE: *tecnica*

- ✓ Generatore 150-200-W con aghi con uncini
- ✓ (*RITA Medical Systems*)
- ✓ Sedazione Cosciente / Anestesia Generale
- ✓ Guida TC



Courtesy of dott Cioni R

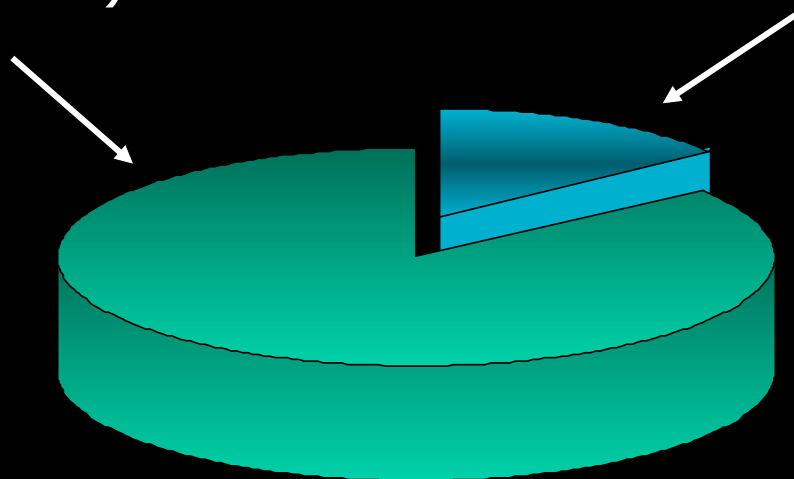


RAPTURE: *risultati*

- *Successo Tecnico* : 105 / 106 patients
- *Follow-up medio*: 11.7 ± 7.9 months

Risposta completa *
88% ($n = 75$)

Risposta incompleta
12% ($n = 10$)

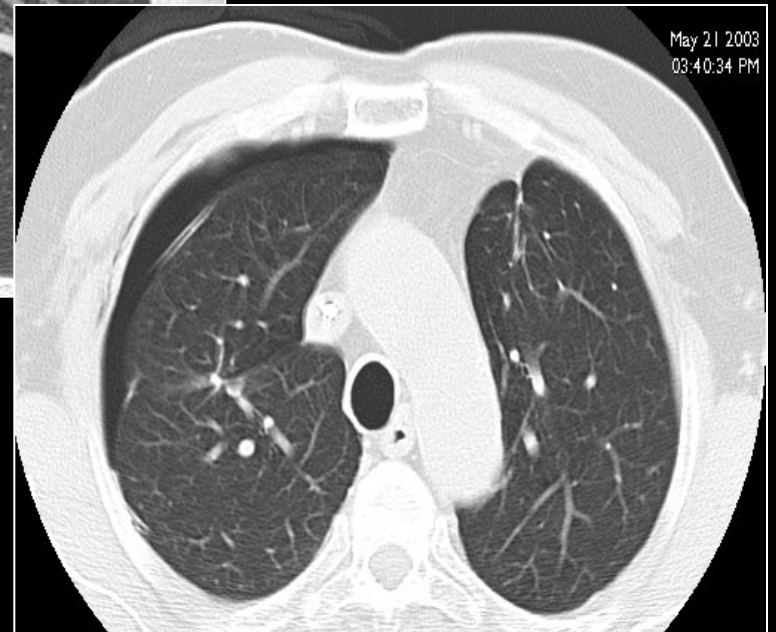
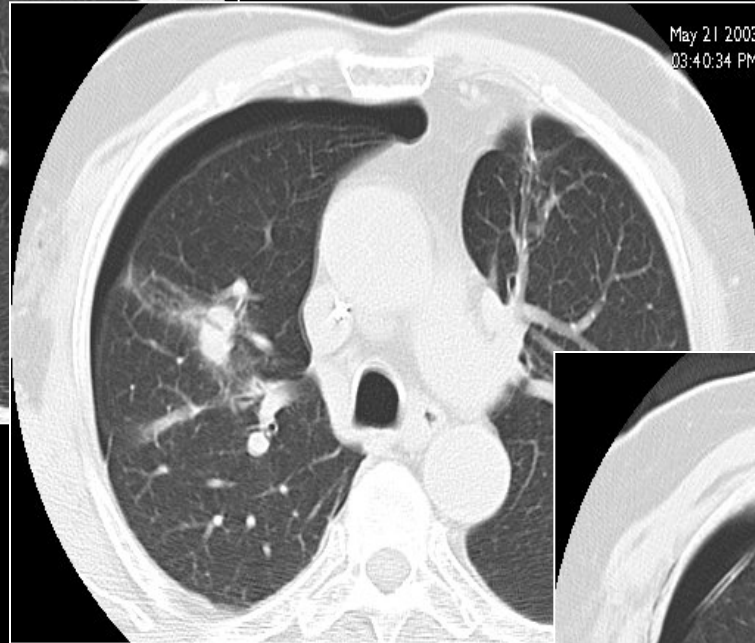
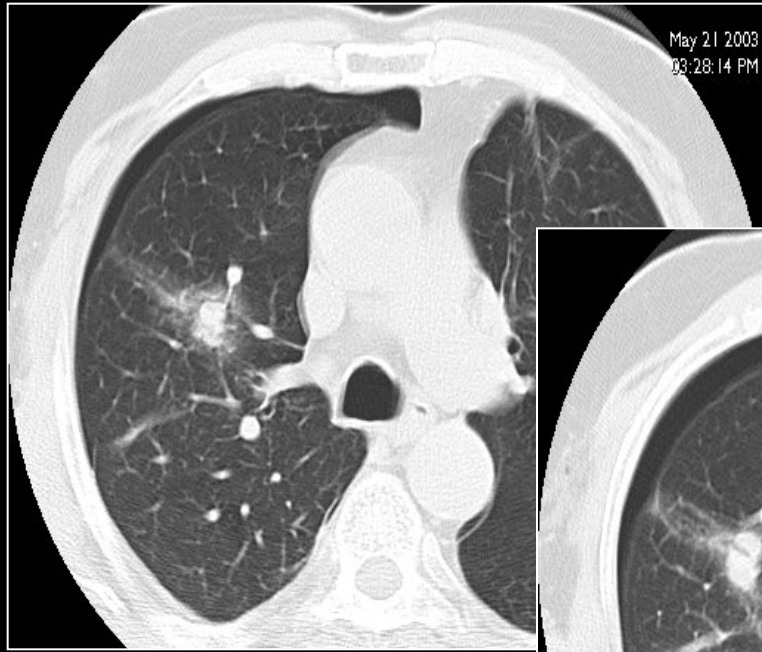


* *Riduzione del diametro maggiore della lesione senza evidenza di crescita della lesione dalla zona di ablazione ed assenza di contrast-enhancement alla TC per almeno 1 anno*

RAPTURE: Complicanze (30 giorni)

Complicanza	NSCLC (<i>n</i> = 40)	CRC (<i>n</i> = 74)	Other (<i>n</i> = 23)	Overall (<i>n</i> = 137)
Pneumotorace (<i>drenaggio</i>)	5 (12%)	19 (26%)	3 (13%)	27 (20%)
Versamento pleurico (<i>drenaggio</i>)	1	3	0	4
Atelettasia	0	1	0	1
Polmoniti	0	1	1	2

RAPTURE: Complicanze



Radiofrequency ablation of lung tumors.

Casal RE, Tam AL, Eapen GA.

Department of Pulmonary Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030, USA.

Oltre 1000 pz trattati a scopo curativo o palliativo

Indicazione "ideale"

NSCLC stadio I ad elevato rischio chirurgico



RT convenzionale sopravvivenza 5 anni 10-30%

Ablation of Pulmonary Malignancy: Current Status

Radiofrequency ablation of pulmonary tumors

Tuttavia, come riportato da diversi Autori, potrebbero beneficiare della terapia ablativa anche:

- NSCLC Stadio IIIB o IV (*nodulo satellite nello stesso lobo o in un altro lobo*)
- Pazienti in cui si riscontri persistenza o progressione locale di malattia al termine del trattamento chirurgico, radio o chemioterapico (*e nei quali il reintervento o la RT siano controindicati*)

Crocetti L, Lencioni R *Radiofrequency ablation of pulmonary tumors* European Journal of Radiology 2010

Pua BB, Thornton RH, Solomon SB *Ablation of Pulmonary Malignancy: Current Status* J Vasc Interv Radiol 2010

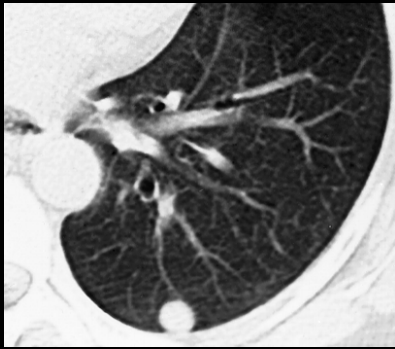
[Clin Chest Med](#), 2010 Mar;31(1):151-63, Table of Contents.

Radiofrequency ablation of lung tumors.

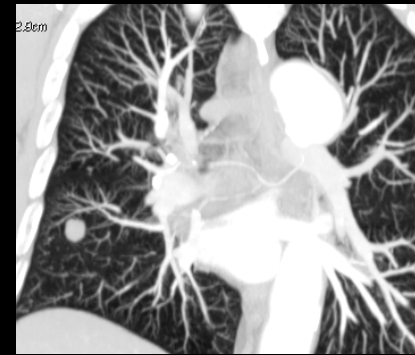
[Casal RF](#), [Tam AL](#), [Eapen GA](#).

Department of Pulmonary Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030, USA.

NSCLC Stadio II : la RF dovrebbe essere usata in combinazione con altri trattamenti, per il possibile coinvolgimento linfonodale non trattabile con la terapia ablativa .



Tumori di dimensioni $\leq 3-3.5$ cm e localizzazione periferica sono i *candidati ideali* per la RF.



Le *dimensioni* e la *sede* del tumore sono *importanti fattori prognostici* per il successo della procedura e la sopravvivenza libera da malattia.

Molti studi riportano infatti una *bassa percentuale* di *necrosi completa* nelle lesioni di *diametro* > 3 cm

Casal RF, Tam AL, Eapen GA *Radiofrequency ablation of lung tumors 2010*

Caroline J. Simon, MD
Damian E. Dupuy, MD
Thomas A. DiPetrillo, MD
Howard P. Safran, MD
C. Alexander Grieco, MD
Thomas Ng, MD
William W. Mayo-Smith, MD

Radiology 2010

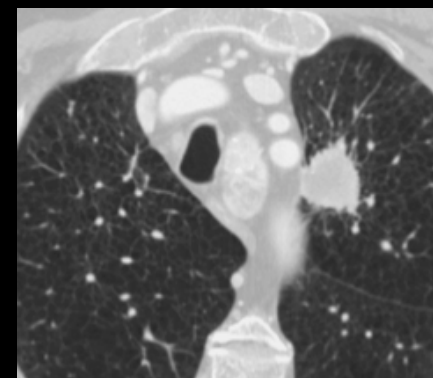
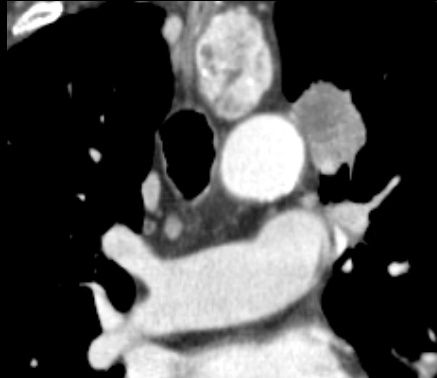
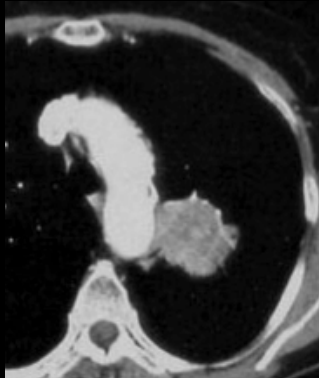
**Pulmonary Radiofrequency
Ablation: Long-term Safety and
Efficacy in 153 Patients¹**

Tempo medio progressione malattia

- 45 mesi nei tumori < 3 cm
- 12 mesi in quelli > 3 cm

*differenza staticamente significativa
($P < .002$)*

Le lesioni localizzate in *prossimità del cuore o dei grossi vasi* e la *pregressa pneumonectomia* non rappresentano controindicazioni assolute, ma devono, in considerazione dell' elevato rischio di complicanze, essere trattate da operatori esperti

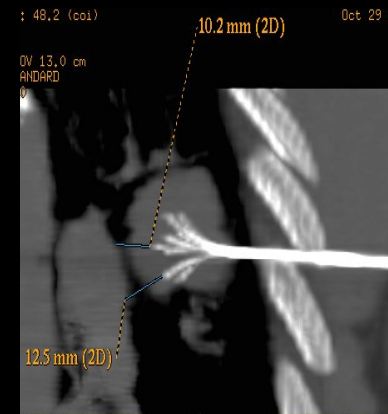
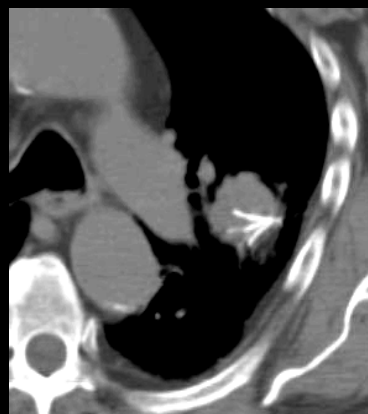


J Vasc Interv Radiol. 2007 Jun;18(6):733-40.

Percutaneous radiofrequency ablation of lung tumors close to the heart or aorta: evaluation of safety and effectiveness.

Iguchi T, Hiraki T, Gobara H, Mimura H, Fujiwara H, Tajiri N, Sakurai J, Yasui K, Date H, Kanazawa S.

Department of Radiology, Okayama University Medical School, 2-5-1 Shikata-cho, Okayama 700-8558, Japan. iguchi@cc.okayamau.ac.jp



Le *metastasi polmonari* da carcinoma colo-rettale non suscettibili di metastasectomia rappresentano attualmente la più frequente indicazione al trattamento con RF.

Casal RF, Tam AL, Eapen GA *Radiofrequency ablation of lung tumors* 2010



Risultati preliminari promettenti sono stati riferiti anche per le metastasi da carcinoma renale .

Ann Surg Oncol (2009) 16:3169–3175
DOI 10.1245/s10434-009-0664-5

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

ORIGINAL ARTICLE – THORACIC ONCOLOGY

Use of Percutaneous Radiofrequency Ablation in Pulmonary Metastases from Renal Cell Carcinoma

Andrew Shu Yan Huo, MBChB¹, David Lawson Morris, MD, PhD, FRACS², Julie King, BA, MPH², and Derek Glenn, MD, FRANZCR³

Un'altra potenziale indicazione descritta in letteratura è il trattamento di pazienti con malattia metastatica ricorrente dopo una pregressa toracotomia, nei quali l'ablazione con RF potrebbe evitare la morbidità (*oltre il 60% di rischio di recidiva*) legata al re-intervento per via toracotomica.

Weiser MR, Downey RJ, Leung DH, Brennan MF *Repeat resection of pulmonary metastases on patients with soft tissue sarcoma.* J Am Coll Surg 2000;191:184–90.

Crocetti L, Lencioni R *Radiofrequency ablation of pulmonary tumors* European Journal of Radiology 2010

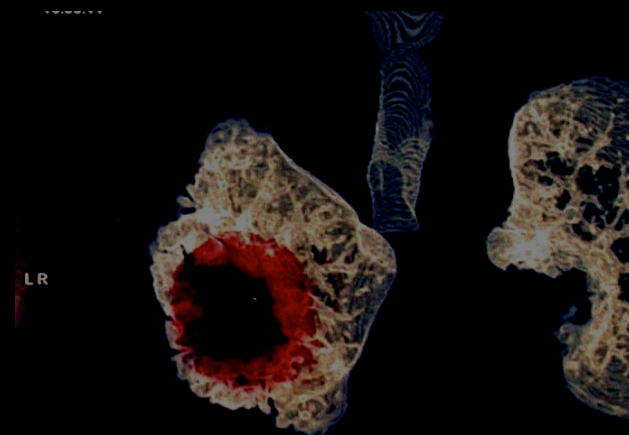
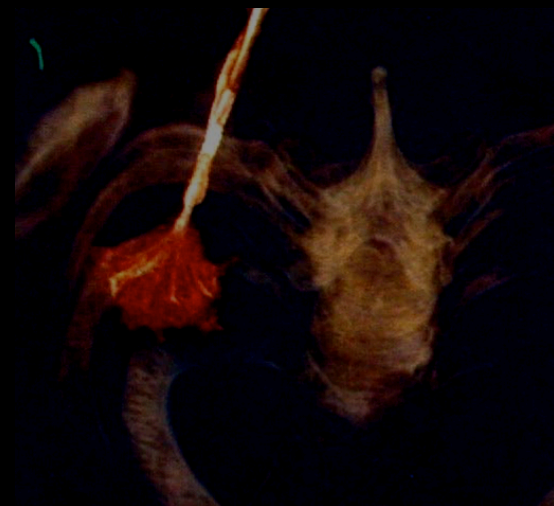


Radiofrequency ablation of pulmonary tumors

Laura Crocetti*, Riccardo Lencioni

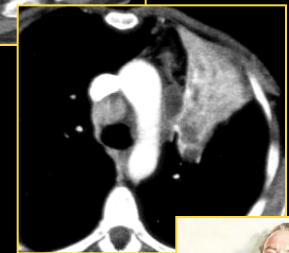
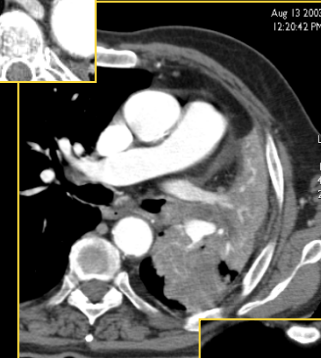
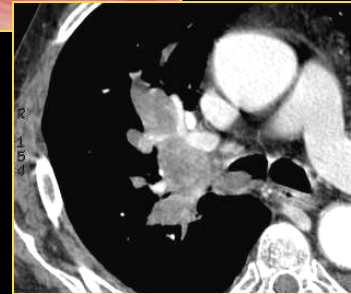
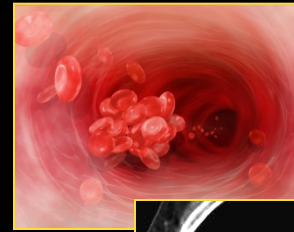
Division of Diagnostic Imaging and Intervention, Department of Liver Transplants, Hepatology and Infectious Diseases, Pisa University School of Medicine, Italy

- Nella maggior parte dei centri il numero di lesioni trattate non è superiore a 5, anche se il numero di lesioni non dovrebbe rappresentare una limitazione alla terapia ablativa purchè sia possibile garantire per tutte un trattamento efficace
- Al fine di ottenere una necrosi completa il diametro massimo delle lesioni non dovrebbe essere superiore ai 3-3.5 cm



Controindicazioni

- coagulopatia grave e non trattabile
- localizzazione del tumore a < 1 cm dalla trachea e dai bronchi principali
- polmonite ostruttiva
- atelettasia
- funzionalità polmonare ridotta ($FEV_1 < 1$ L)



Curr Probl Diagn Radiol, January/February 2009

Radiofrequency Ablation of Lung Lesions: Practical Applications and Tips

A. Molly Roy, MBBS, MRCS, Clare Bent, MB, BCh, FRCR,

Risultati NSCLC

- ✓ **Sopravvivenza :** 78-95% a 1 anno
57-84% a 2 anni

Semin Thorac Cardiovasc Surg, 2008 Winter;20(4):279-84.

Radiofrequency ablation for the treatment of stage I non-small cell lung neoplasm.

Pennathur A, Abbas G, Landreneau RJ, Luketich JD.

The Heart, Lung, and Esophageal Surgery Institute, University of Pittsburgh Medical Center, 200 Lothrop Street, Pittsburgh, PA 15213, USA. apennathur@aol.com

Semin Thorac Cardiovasc Surg, 2010 Spring;22(1):53-8.

Image-guided radiofrequency ablation for the treatment of early-stage non-small cell lung neoplasm in high-risk patients.

Pennathur A, Abbas G, Schuchert MJ, Landreneau RJ, Luketich JD.

The Heart, Lung, and Esophageal Surgery Institute, University of Pittsburgh Medical

J Vasc Interv Radiol, 2010 Aug;21(8 Suppl):S223-32.

Ablation of pulmonary malignancy: current status.

Pua BB, Thornton RH, Solomon SB.

Department of Radiology, Memorial Sloan-

Clin Chest Med, 2010 Mar;31(1):151-63, Table of Contents.

Radiofrequency ablation of lung tumors.

Casal RF, Tam AL, Eapen GA.

Department of Pulmonary Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030, USA.

European Journal of Radiology 75 (2010) 23–27

Radiofrequency ablation of pulmonary tumors

Laura Crocetti*, Riccardo Lencioni

- ✓ **Sopravvivenza cancro-specifica**

(difficile valutazione in pazienti ad alto rischio con gravi comorbidità)

Revisione letteratura (*8 studi*)

- 82% (range 58-100%)
- follow-up medio di 89.8 ± 8.6 mesi.

J Thorac Imaging, 2011 Feb;26(1):18-26.

Percutaneous radiofrequency ablation of lung tumors: evaluation of the literature using evidence-based techniques.

Chan VO, McDermott S, Malone DE, Dodd JD.

Department of Radiology, St Vincent's University Hospital, Dublin, Ireland.

Potenziale effetto sinergico della RF seguita dalla RT convenzionale nel trattamento di NSCLC al I-II stadio



24 pazienti in stadio I
sopravvivenza cumulativa

83% a 1 anno
50% a 2 anni
39% a 5 anni

[J Vasc Interv Radiol](#). 2006 Jul;17(7):1117-24.

Percutaneous image-guided thermal ablation and radiation therapy: outcomes of combined treatment for 41 patients with inoperable stage I/II non-small-cell lung cancer.

[Grieco CA](#), [Simon CJ](#), [Mayo-Smith WW](#), [DiPetrillo TA](#), [Ready NE](#), [Dupuy DE](#).

Department of Diagnostic Imaging, Brown University Medical School, Rhode Island Hospital, 593 Eddy Street, Providence, RI 02903, USA.

41 pazienti- stadio I e II

87% a 1 anno
70% a 2 anni
57% a 3 anni

Risultati MTS

- ✓ Metastasi polmonari da colon-retto: 78-89% a 1 anno
54-78% a 2 anni
46-57% a 3 anni
- ✓ Fattori prognostici : dimensioni della neoplasia (< 3 cm)
assenza di malattia extrapolmonare
negatività del CEA. *Crocetti L, Lencioni R. Radiofrequency ablation of pulmonary tumors 2010*
Casal RF, Tam AL, Eapen GA. Radiofrequency ablation of lung tumors 2010

In presenza di lesioni inferiori a 3 cm e assenza di malattia a distanza la sopravvivenza a 3 anni è stata del 78%, non dissimile da quella riferita per la chirurgia

[J Thorac Cardiovasc Surg, 2003 Sep;126\(3\):732-9.](#)

Prognostic factors and survival after complete resection of pulmonary metastases from colorectal carcinoma: experiences in 167 patients.

[Pfannschmidt J, Muley T, Hoffmann H, Dienemann H.](#)

[Oncol Rep, 2009 Oct;22\(4\):885-91.](#)

Long-term results of radiofrequency ablation in colorectal lung metastases: single center experience.

[Yamakado K, Inoue Y, Takao M, Takaki H, Nakatsuka A, Uraki J, Kashima M, Kusunoki M, Shimpo H, Takeda K.](#)

Sopravvivenza cancro-specifica

10 studi unicamente trattamento metastasi polmonari (2002-2009)

- ✓ 75.2% (range 55-90%)
- ✓ follow-up medio 72.3 ± 13.4 mesi

[J Thorac Imaging, 2011 Feb;26\(1\):18-26.](#)

Percutaneous radiofrequency ablation of lung tumors: evaluation of the literature using evidence-based techniques.

[Chan VO, McDermott S, Malone DE, Dodd JD.](#)

Department of Radiology, St Vincent's University Hospital, Dublin, Ireland.

Complicanze

- ✓ Mortalita' : 0 – 2.6%
- ✓ Morbilità media : 24.6%
 - pneumotorace 30-60%
 - 10% drenaggio
 - versamento pleurico 14.8%
 - 1-7% drenaggio
 - emorragie intraparenchimali 10%
 - polmoniti, emottisi,
 - peggioramento BPCO < 1%

Radiofrequency ablation of lung tumors.

[Casal RF](#), [Tam AL](#), [Eapen GA](#).

Department of Pulmonary Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030, USA.

Percutaneous radiofrequency ablation of lung tumors: evaluation of the literature using evidence-based techniques.

[Chan VO](#), [McDermott S](#), [Malone DE](#), [Dodd JD](#).

Department of Radiology, St Vincent's University Hospital, Dublin, Ireland.

✓ ESPERIENZA TORINESE

75 pazienti

- 25 NSCLC, 50 MTS

- ✓ 42 da T apparato digerente (16 in associazione a RFA epatica)

- ✓ 3 da sarcomi

- ✓ 5 da altri tumori (rene, mammella, laringe, ovaio, prostata)

- 60 Lesioni (10-80 mm, media 23.1 mm)

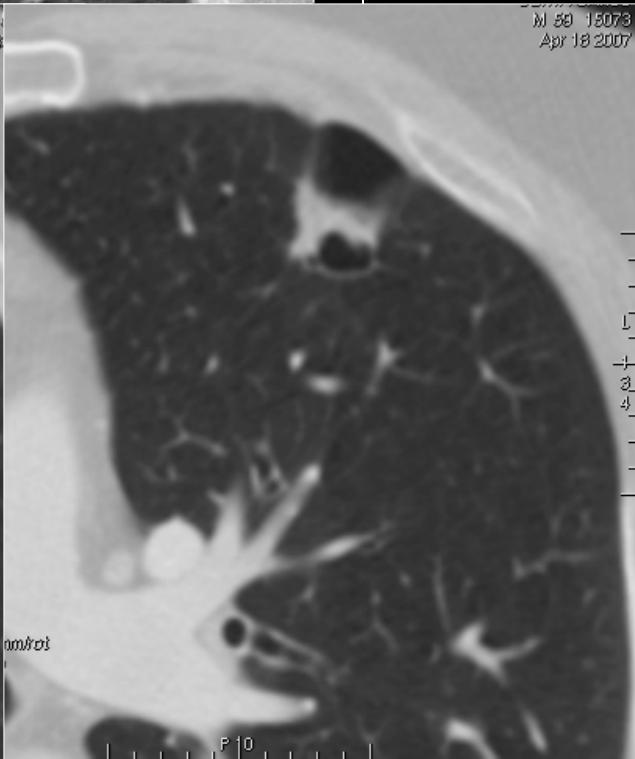
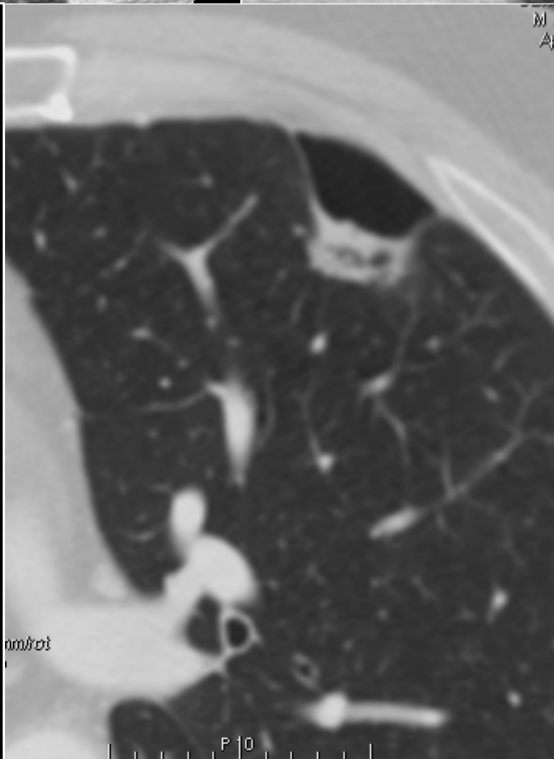
- ✓ 50 guida TC, 10 guida US

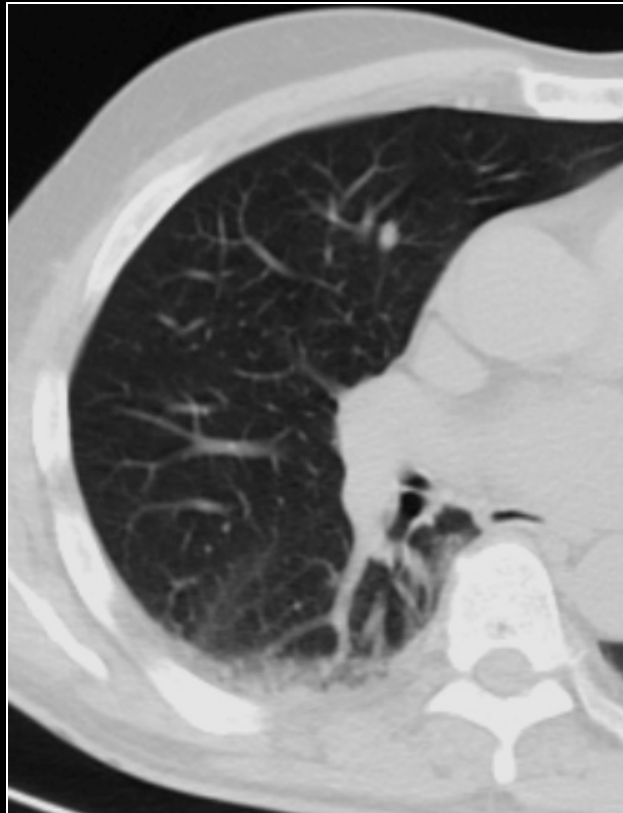
✓ ESPERIENZA TORINESE

- Eventi avversi

- ✓ *Maggiori 10 % (5 PNX drenato; 1 ascesso)*

- ✓ *Minori 16.7% (dolore, emoftoe, febbre, paralisi diaframma, pneumatocele, reazione pleurica)*





ge size: 512 x 512
w size: 763 x 644
-138 WW: 2305



mm: 149% Angle: 0
8/12 I(S -> I)

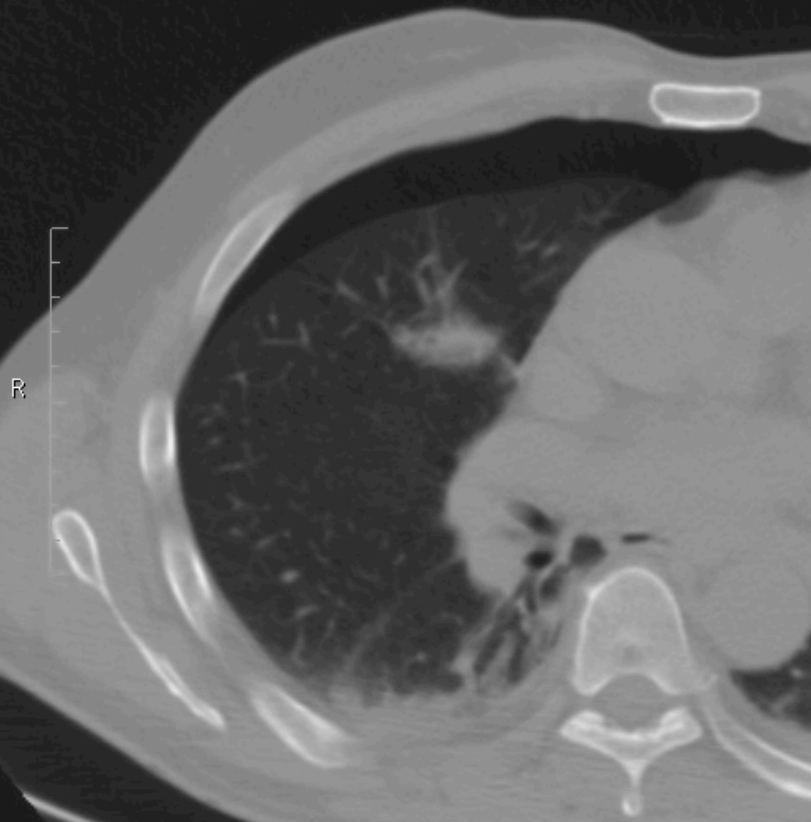
ge size: 512 x 512
w size: 758 x 623
-138 WW: 2305



mm: 148% Angle: 0
8/12 I(S -> I)
thickness: 6.00 mm Location: -97.00 mm
P

Image size: 512 x 512
View size: 841 x 644
WL: -138 WW: 2305

A

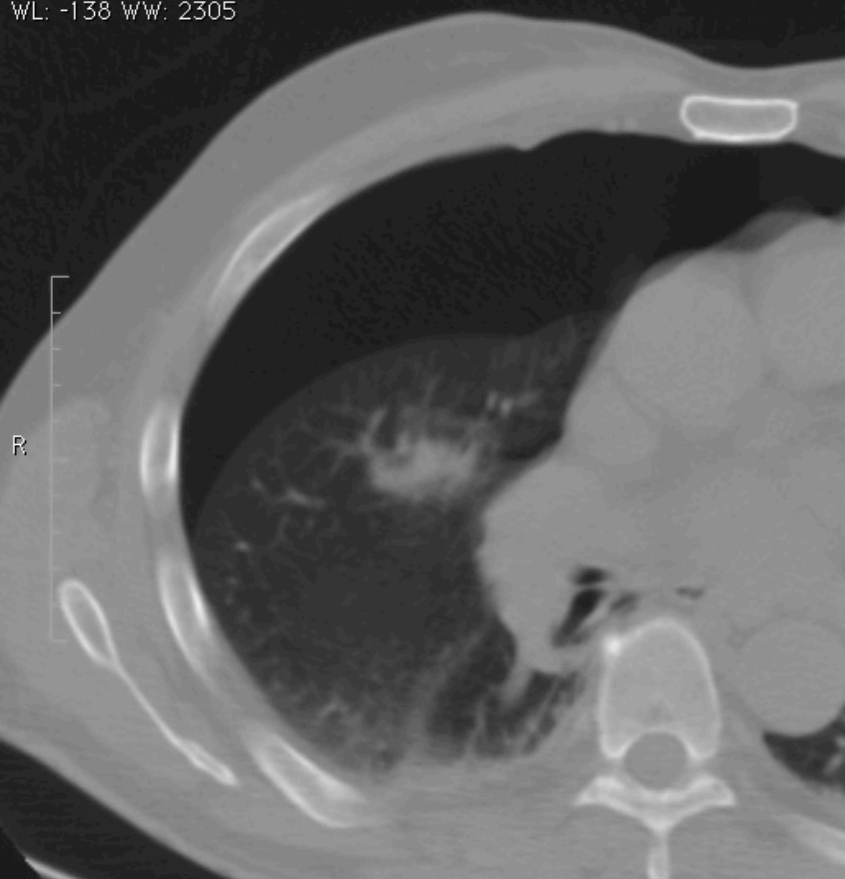


Zoom: 164% Angle: 0
Im: 7/12 (S -> I)
Thickness: 6.00 mm Location: -91.00 mm

P

Image size: 512 x 512
View size: 886 x 644
WL: -138 WW: 2305

A



Zoom: 173% Angle: 0
Im: 7/12 (S -> I)
Thickness: 6.00 mm Location: -91.00 mm

P

Image size: 512 x 512
View size: 771 x 575
WL: -600 WW: 1600

A

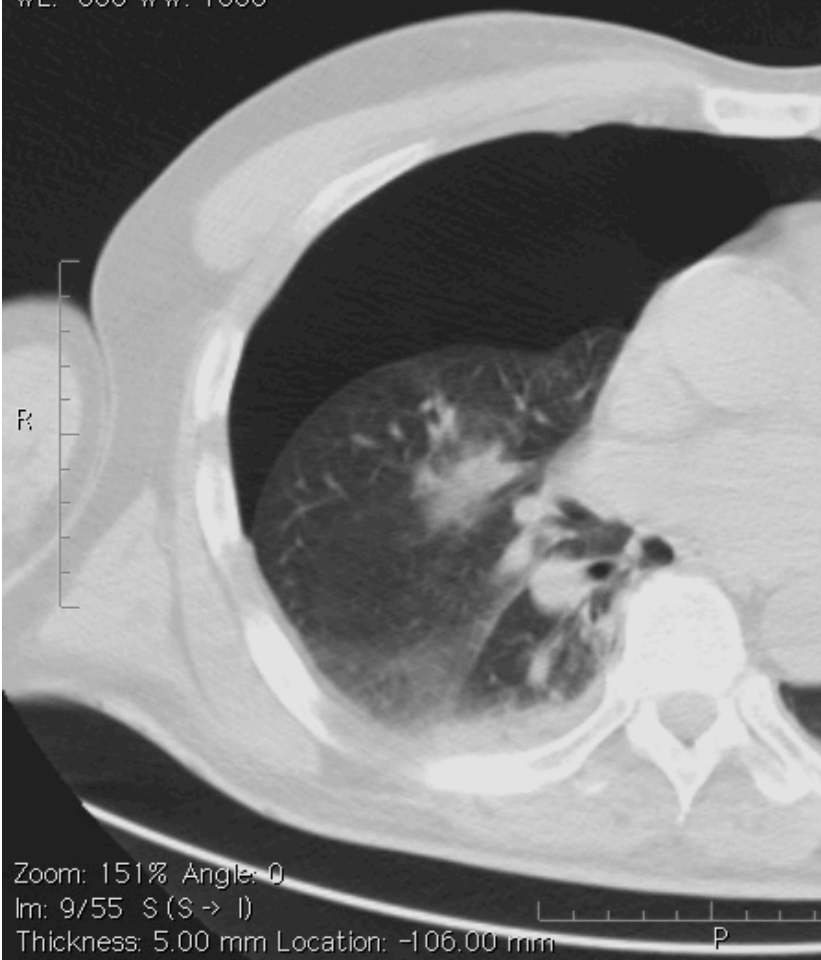


Image size: 512 x 512
View size: 931 x 644
WL: -500 WW: 1400

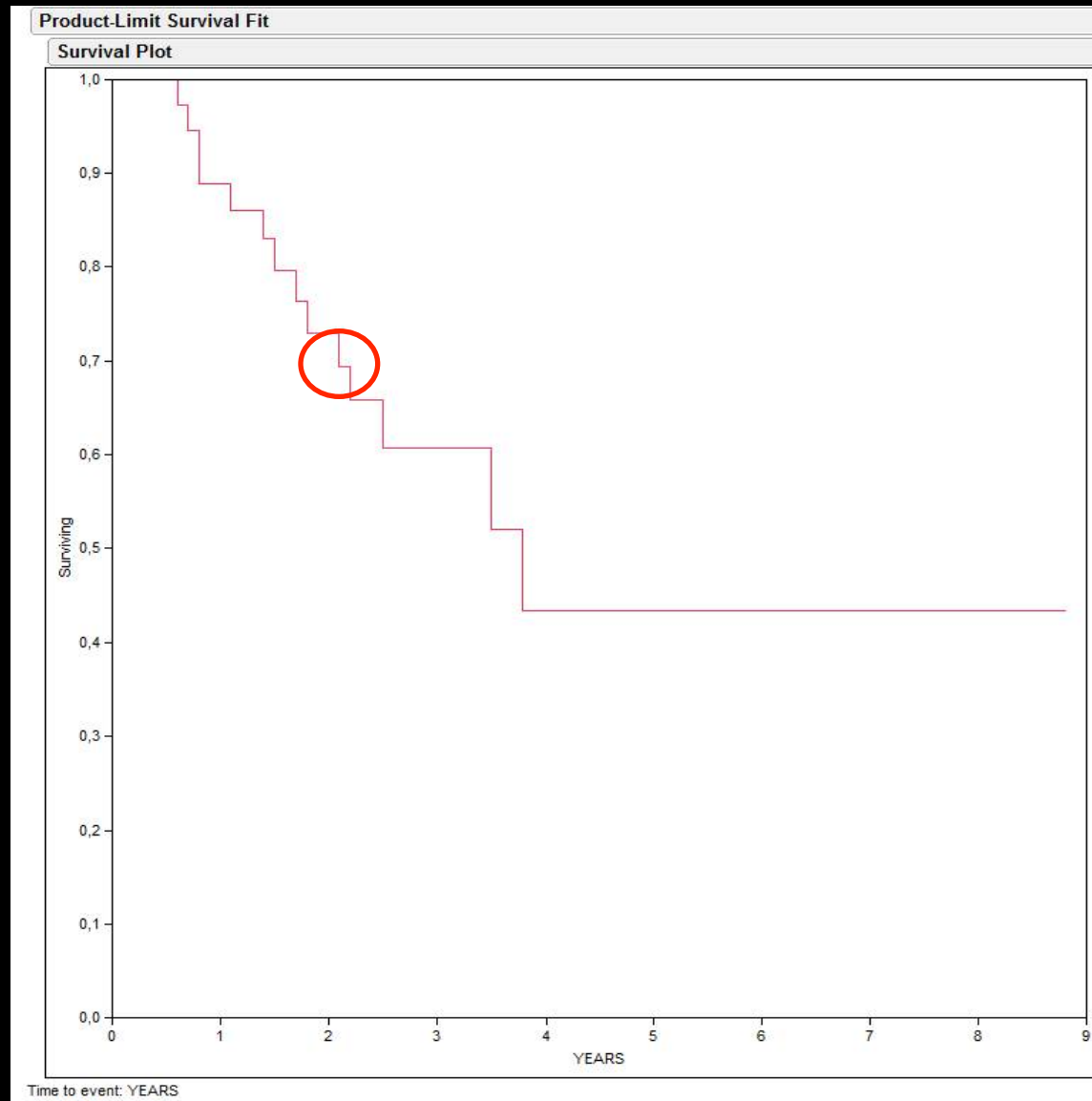
A



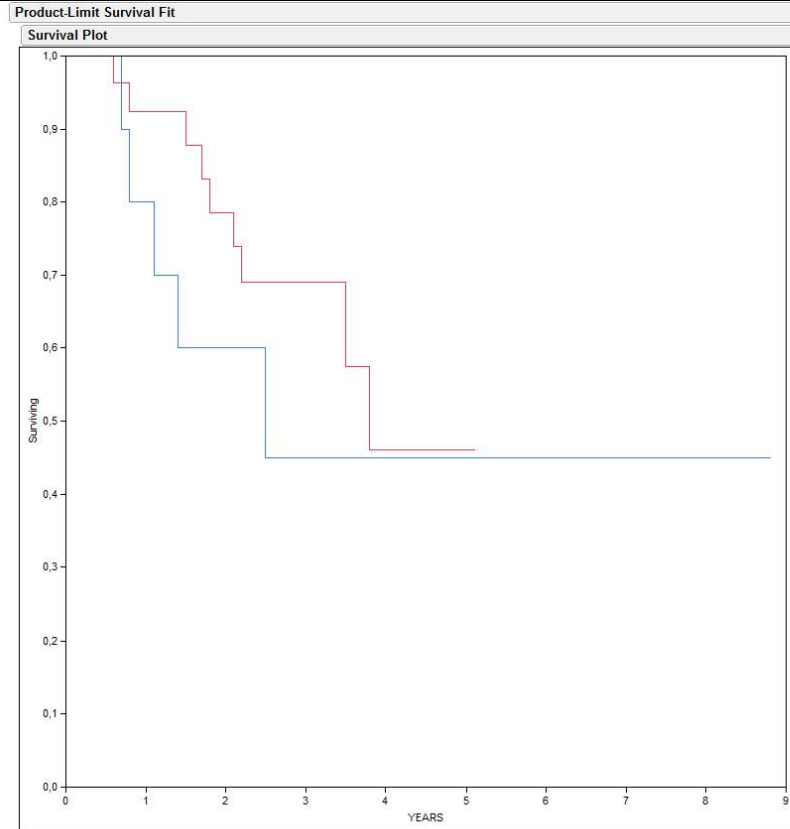
✓ ESPERIENZA TORINESE

- Follow-up 1-108 mesi, media 22 mesi
- Controllo locale 44/60 lesioni (73%)
- ✓ *Ø medio CI 20.7 mm, R 29.6 mm (p=.0174)*
- 14/50 Pz deceduti
- ✓ *Overall survival*
- ✓ *Predittori (diametro, malattia extraepatica)*

✓ ESPERIENZA TORINESE



✓ ESPERIENZA TORINESE



Time to event: YEARS
Censored by Morto
Censor Code 1
Grouped by Group

Summary

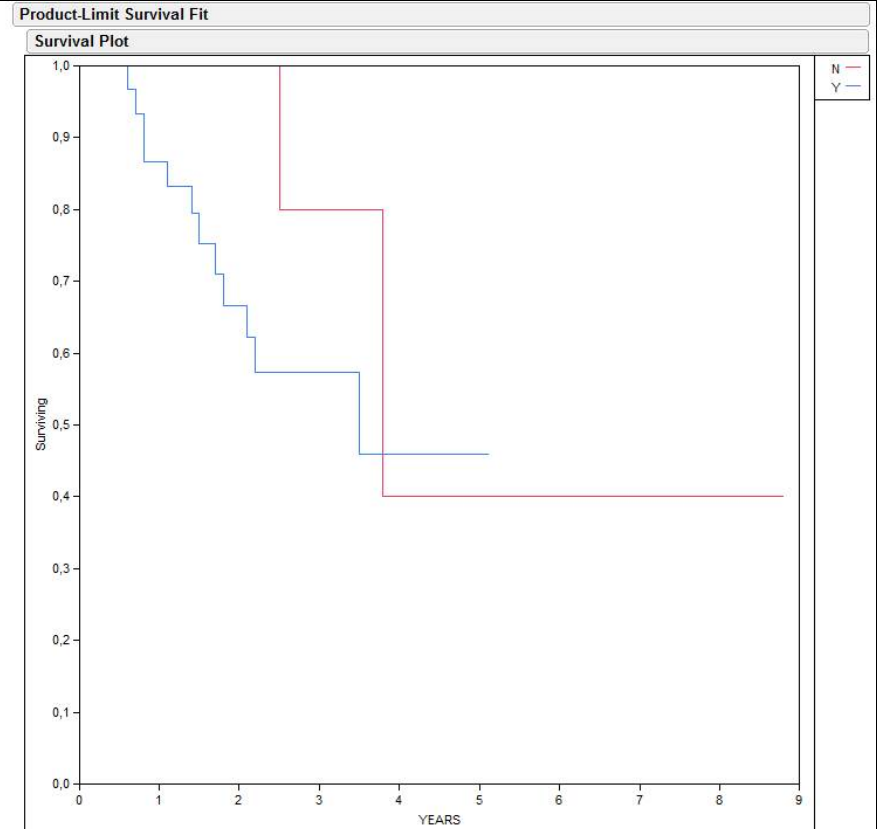
Group	Number		Mean	Std Error
	failed	censored		
<3cm	9	28	3,07813	0,23298
>3cm	5	8	1,9	0,26693
Combined	14	36	2,88446	0,21417

Quantiles

Group	Median Time	Lower95%	Upper95%	25% Failures	75% Failures
<3cm	3,8	2,2	-	2,1	-
>3cm	2,5	0,7	-	1,1	-
Combined	3,8	2,2	-	1,8	-

Tests Between Groups

Test	ChiSquare	DF	Prob>ChiSq
Log-Rank	1,3327	1	0,2483
Wilcoxon	2,0817	1	0,1491



Time to event: YEARS

Censored by Morto

Censor Code 1

Grouped by Altre Lesioni Pre-

Summary

Group	Number		Mean	Std Error
	failed	censored		
N	2	9	3,54	0,32888
Y	12	27	2,60869	0,22188
Combined	14	36	2,88446	0,21417

Quantiles

Group	Median Time	Lower95%	Upper95%	25% Failures	75% Failures
N	3,8	2,5	-	3,8	-
Y	3,5	1,8	-	1,7	-
Combined	3,8	2,2	-	1,8	-

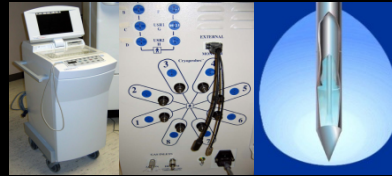
Tests Between Groups

Test	ChiSquare	DF	Prob>ChiSq
Log-Rank	0,8687	1	0,3513
Wilcoxon	2,1155	1	0,1458

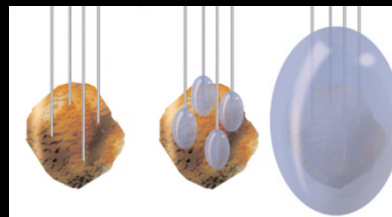
Terapie ablative locali alternative

Impiego di energia termica

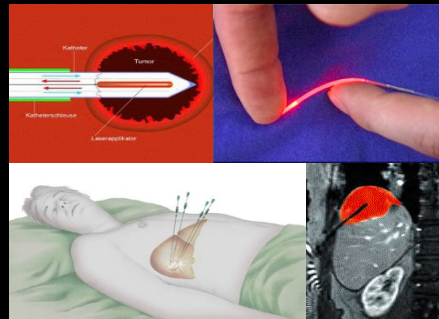
✓ RF



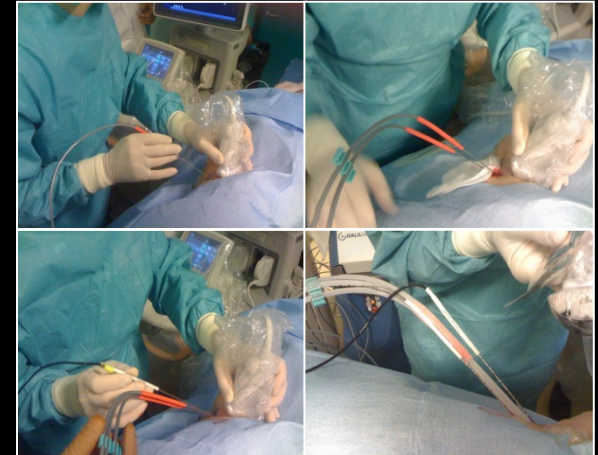
✓ Crioterapia



✓ Laser



✓ HIFU



Radio Med
 ISSN 1120-3329 (print) / ISSN 1120-3337 (online)
**ABDOMINAL RADIOLOGY
 RADIOLOGIA ADDOMINALE**
High-intensity focused ultrasound (HIFU) in patients with solid malignancies: evaluation of feasibility, local tumour response and clinical results
Ultrasuoni focalizzati ad elevata intensità (HIFU) in pazienti con tumori solidi. Valutazione della fattibilità, della risposta locale e dei risultati clinici
 G. Orgera¹ • L. Monfardini¹ • P. Della Vigna¹ • L. Zhang² • G. Bonomo³ • P. Arnone⁴ • M. Padrenostro⁵ • F. Orsi⁶
¹Interventional Radiology Unit of European Institute of Oncology, 435 Via Ripamonti, 20141 Milan, Italy
²Clinical Center for Tumor Therapy of 2nd Hospital of Chongqing University of Medical Sciences, Chongqing 400010, China
³Division of Pathology, European Institute of Oncology, 435 Via Ripamonti, 20141 Milan, Italy
⁴School of Medicine, University of Milan, Milan, Italy

Radiol med

Table 2 Characteristics of the 22 patients with 29 tumours treated with high-intensity focused ultrasound (HIFU)

Site	Number of tumours	Patients
Liver	13	8
Bone	4	3
Soft tissue	5	5
Pancreas	6	6
Lung	1	1
Total	29	22



- Elevata temperatura intratumorale (170 °C)
- Rispetto ad RF: più rapidi tempi di procedura, necrosi più ampie, non utilizzo di placche, *minor dolore*
- Possibile impiego contemporaneo di antenne multiple
- Dispersione del calore a pochi mm dall'antenna: minor rischio di danno iatrogeno

Radiology. 2008 Apr;247(1):80-7. Epub 2008 Feb 21.

Microwave ablation with triaxial antennas tuned for lung: results in an in vivo porcine model.

Durick NA, Laeseke PF, Broderick LS, Lee FT Jr, Sampson LA, Frey TM, Warner TE, Fine JP, van der Weide DW, Brace CL.

Department of Radiology, University of Wisconsin-Madison, 600 Highland Ave, Box 3252, E3/311 CSC, Madison, WI 53792-3252, USA.

Curr Probl Diagn Radiol. 2009 May-Jun;38(3):135-43.

Radiofrequency and microwave ablation of the liver, lung, kidney, and bone: what are the differences?

Brace CL.

Department of Radiology, University of Wisconsin, Madison, WI 53792-3252, USA. clbrace@wisc.edu

Complications of microwave and radiofrequency lung ablation: personal experience and review of the literature

Complicanze della termo-ablazione polmonare con microonde e radiofrequenza: esperienza personale e revisione della letteratura

G. Carrafiello • M. Mangini • F. Fontana • A. Di Massa • A.M. Ierardi • E. Cotta • F. Piacentino
L. Nocchi Cardim • C. Pellegrino • C. Fugazzola

Riassunto

Obiettivo. *Scopo del presente studio è stato analizzare retrospettivamente le complicanze registrate nel trattamento termo-ablativo con radiofrequenze (RFA) e con microonde (MWA) di tumori polmonari, confrontarli con i dati riportati in letteratura e valutare i fattori di rischio correlati alle due procedure.*

Materiali e metodi. *Da gennaio 2003 a gennaio 2009, 29 pazienti (36 lesioni polmonari) sono stati trattati con RFA; da gennaio 2007 a gennaio 2009, 16 pazienti (17 lesioni polmonari) sono stati trattati con MWA. Le complicanze da noi registrate sono state riportate seguendo le linee guida della Society of Interventional Radiology (SIR). È stata eseguita anche una revisione della letteratura.*

Risultati. *Nessuna complicanza maggiore è stata osservata. In accordo con i dati presenti in letteratura, lo pneumotorace è la complicanza più frequente anche se la sua incidenza nella nostra casistica è più bassa (5,8% versus 4,3%–18% in letteratura). Nella nostra casistica, le complicanze post-RFA includono la soffiuzione pleurica e l'enfisema sottocutaneo. Non è stato osservato nessun caso di emorragia massiva, emottisi, nessuna infezione polmonare, né ascesso né disseminazione tumorale. Anche, nei pazienti trattati con MWA, la complicanza più frequente è stata lo pneumotorace (25% versus 39% riportato in letteratura). La soffiuzione pleurica è un riscontro frequente, ma in nessun caso è stato necessario il posizionamento di un drenaggio.*

Conclusioni. *Lo pneumotorace è la complicanza più frequente in entrambe le procedure. La termo-ablazione percutanea, sia RFA che MWA, rappresenta un'ottima opzione terapeutica in termini di sicurezza e tolleranza.*

Take Home Points

1. La RFA polmonare garantisce elevato controllo locale in pazienti con piccole neoplasie polmonari, ed è associata ad una morbifità accettabile
2. I tassi di sopravvivenza cancro-specifici supportano il possibile uso della RF per NSCLC o metastasi CR nei pazienti ad elevato rischio chirurgico
3. Sono necessari ulteriori studi – in particolare RCTs – per stabilire il ruolo della RF rispetto ai protocolli di chemio / radio terapia

Radiofrequency ablation of lung tumors.

Casal RF, Tam AL, Eapen GA.

Department of Pulmonary Medicine, The University of Texas MD Anderson Cancer Center, 1515 Holcombe Boulevard, Houston, TX 77030, USA.



Technical Procedure

The decision to perform RFA for the treatment of lung tumors should ideally be made by a multidisciplinary team composed of a thoracic surgeon, a thoracic oncologist, a radiation oncologist, a pulmonologist, an anesthesiologist, and an interventional radiologist.¹⁵ The pre-procedural evaluation is very similar to that of a surgical procedure where cardiopulmonary conditions and bleeding risk are thoroughly assessed. In patients with cardiac pacemakers, use of an alternative focal ablative technology such as microwave or cryo-ablation may be preferable, particularly in patients who are constantly dependent on a functioning pacemaker.⁹ Some authors suggest that patients who are healthy enough to undergo a CT-guided needle biopsy of the lung are generally good candidates for RFA.²³