

Lung Ablation: Patient & Lesion Selection

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Disclosures

Consultant – Boston Scientific

Grant/Research Support – Boston Scientific, Guerbet LLC

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MDACC Lung Ablation Practice: Multidisciplinary Approach

<h2>IR Clinic Visit</h2> <ul style="list-style-type: none">• Review of relevant clinical history<ul style="list-style-type: none">» Cancer history» PFTs» Labs• Review of the images<ul style="list-style-type: none">» Clinical staging• Discuss treatment<ul style="list-style-type: none">» What to expect at the time of ablation• Discuss follow up plan<ul style="list-style-type: none">» Stress the need for rigorous follow up	<h2>Technical Issues</h2> <p>Choice of Imaging:</p> <ul style="list-style-type: none">• CT <p>Choice of Sedation:</p> <ul style="list-style-type: none">• Conscious Sedation• General Anesthesia <p>Choice of Devices:</p> <ul style="list-style-type: none">• RFA• Microwave• Cryoablation	<h2>Follow-up Surveillance</h2> <p>Imaging Intervals:</p> <ul style="list-style-type: none">• CECT<ul style="list-style-type: none">– 1, 3, 6, (\pm9), 12 months– Less frequent in the following years (Q6 mos)• PET-CT<ul style="list-style-type: none">– Role of early PET is not clear– Reasonable algorithm: 6, 12, 24 months<ul style="list-style-type: none">» And when CECT shows signs suspicious for recurrence
<h2>Pre-Ablation</h2>	<h2>Ablation</h2>	<h2>Post-Ablation</h2>

Clinical Rationale for Ablative Therapy

- **International Registry of Lung Metastases**

- 5,206 Patients
- 4,752 (88%) Complete Resection

Resection	5 Yrs.	10 Yrs.	Median
Complete	36%	26%	35 mos.
Incomplete	13%	7%	15 mos.

- **Complete ablation may have the same effect: ablation = surrogate of surgery**

- Number
- Size
- Location

J Pastorino U, et al. *J Thorac Cardiovasc Surg.* 1997;113(1):37-49.

A0 Ablation

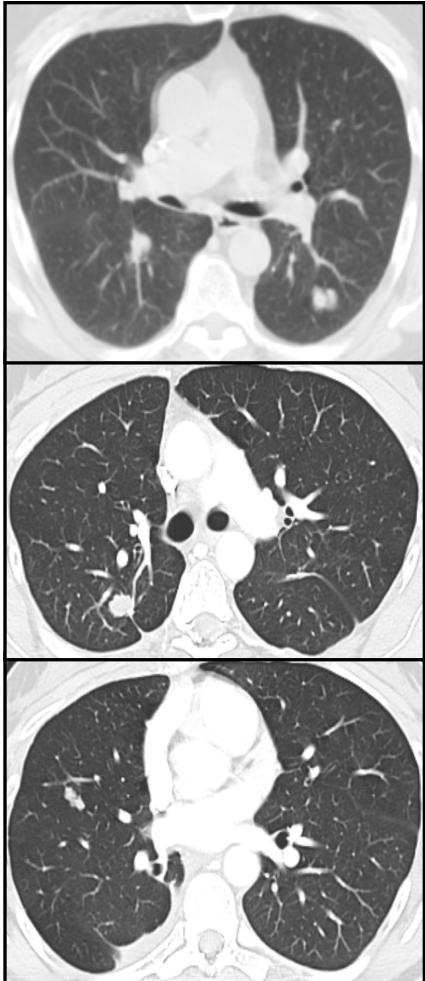
- Concept that can be applied across organ sites
- Ablation margins predict local tumor progression
- Limitation to this extrapolated definition given lack of pathologic confirmation of margins
 - Role of biopsy of ablation margin to detect risk of local tumor progression
 - Importance of patient compliance with post-operative imaging follow-up schedule
- **A margin of >5 mm should be mandatory when offering ablation with curative intent**
- **Margins > 10mm likely to provide complete tumor necrosis and is recommended whenever safe and feasible**

Sotirchos VS, et al. *Radiology*. 2016;280(3):949-59. Shady W, et al. *J Vasc Interv Radiol*. 2018;29(2):268-275.e1.

NCCN Guidelines

- **Disease states in which ablation is an accepted loco-regional treatment option:**
 - HCC: primary and metastatic setting
 - Colorectal cancer: liver and lung metastases
 - RCC: primary and metastatic setting
 - NSCLC: primary and metastatic setting
 - Sarcoma: metastatic setting for soft tissue and uterine sarcomas
- **Updated frequently**
- **Subject to interpretation, which may be challenging (energy modality)**

Patient & Energy Selection – Keys to Good Outcomes & Risk Mitigation



Patient Factors

High risk for surgery
Prior thoracotomy
Difficult lesion
Prior XRT

Tumor Factors

Size: < 3 cm
Number: 4 per lung
Location: Peripheral
No extrapulmonary mets
Biology: RCC, CRC, NSCLC

TABLE 1. Comparing Ablative Technologies

Parameter(s)	Radiofrequency	Microwave	Cryoablation
Set up	++	+++ (quickest)	+
Duration of ablation	++	+++ (shortest)	+
≤ 3 cm	+++	+++	+++
> 3 cm	+	+++	++
≤ 1.5 cm pleura	+ (pain)	+ (pain, air leak)	+++
Emphysema	++	+++	+
Chest wall	+	++	+++
Mediastinum	+	+	++
Thermal sinks	+	+++ (least)	++
Preservation of collagen	+	+	+++
Coagulopathies	+++	+++	+

Abtin F, et al. *J Thorac Imaging*. 2019;34(4):266-277.

Epidemiology, management and prognosis of colorectal cancer with lung metastases: a 30-year population-based study

Emmanuel Mitry,^{1,2} Boris Guiu,^{1,3} Simona Coscionea,¹ Valérie Jooste,¹ Jean Faivre,¹ Anne-Marie Bouvier¹

Overall, 4.1% of synchronous lung metastases and 14.3% of metachronous lung metastases were resected for cure.

The 3-year relative survival was 11.3% for synchronous lung metastases and 13.8% for metachronous lung metastases. It was, respectively, 53% and 59.2% after resection for cure.

Unless surgical resection is possible, the prognosis for lung metastasis remains very poor.

Significant opportunity for treatment optimization for patients with CRC mets to lung

Mitry E, et al. *Gut*. 2010;59(10):1383-8.

Significance of this study

What is already known about this subject?

- The lung is the most common extra-abdominal site of metastases from colorectal cancer
- The real frequency in the general population for both synchronous and metachronous lung metastases is not known
- There are no population-based studies reporting survival data on patients with lung metastases from colorectal cancer

What are the new findings?

- There was a nearly threefold increase in the frequency of synchronous lung metastases between the 1976–1980 and 2001–2005 periods
- The 5-year cumulative rate of metachronous lung metastases was 5.8% and remained stable over time
- Compared to colon cancer, rectal cancers had a higher risk of developing lung metastases

How might it impact on clinical practice in the foreseeable future?

- Patients with rectal cancer may benefit from a specific surveillance strategy

Radiofrequency ablation is a valid treatment option for lung metastases: experience in 566 patients with 1037 metastases

T. de Baère^{1*}, A. Aupérin², F. Deschamps¹, P. Chevallier³, Y. Gaubert⁴, V. Boige⁵, M. Fonck⁶, B. Escudier⁵ & J. Palussière⁷

Departments of ¹Image Guided Therapy; ²Biostatistics, Gustave Roussy Cancer Campus, Villejuif; ³Department of Imaging, Hôpital Archet 2, Nice; ⁴Department of Imaging, Hôpital de la Timone, Marseille; ⁵Department of Medical Oncology, Gustave Roussy Cancer Campus, Villejuif; Departments of ⁶Medical Oncology; ⁷Imaging, Institut Bergonie, Bordeaux, France

Table 1. Rates (standard error) of overall survival, progression-free survival and treatment failure according to the primary

	Primary	Colon (N = 191)	Rectum (N = 102)	Kidney (N = 68)	Sarcoma (N = 51)	Other (N = 154)
Overall survival						
1 year	92.9% (1.9)	93.6% (2.5)	95.5% (2.6)	94.1% (3.3)	89.0% (2.6)	
3 years	76.1% (3.7)	64.9% (6.3)	73.5% (6.5)	58.0% (8.2)	59.1% (4.6)	
5 years	56.0% (6.0)	49.6% (8.4)	53.8% (9.1)	41.5% (9.3)	49.4% (6.4)	
Progression-free survival						
1 year	37.6% (3.6)	30.4% (4.8)	39.7% (5.9)	43.0% (7.0)	49.0% (4.1)	
3 years	17.0% (3.0)	8.6% (3.2)	13.8% (4.9)	26.5% (6.6)	17.6% (3.4)	
5 years	14.8% (3.0)	6.4% (3.0)	9.2% (5.0)	15.9% (6.2)	7.6% (3.9)	
Treatment failure						
1 year	10.9% (2.4)	14.5% (3.7)	7.4% (3.2)	6.1% (3.4)	9.9% (2.5)	
2 years	16.2% (3.0)	30.7% (5.7)	13.0% (5.0)	8.3% (4.0)	16.4% (3.5)	
3 years	16.2% (3.0)	30.7% (5.7)	25.1% (9.3)	8.3% (4.0)	16.4% (3.5)	

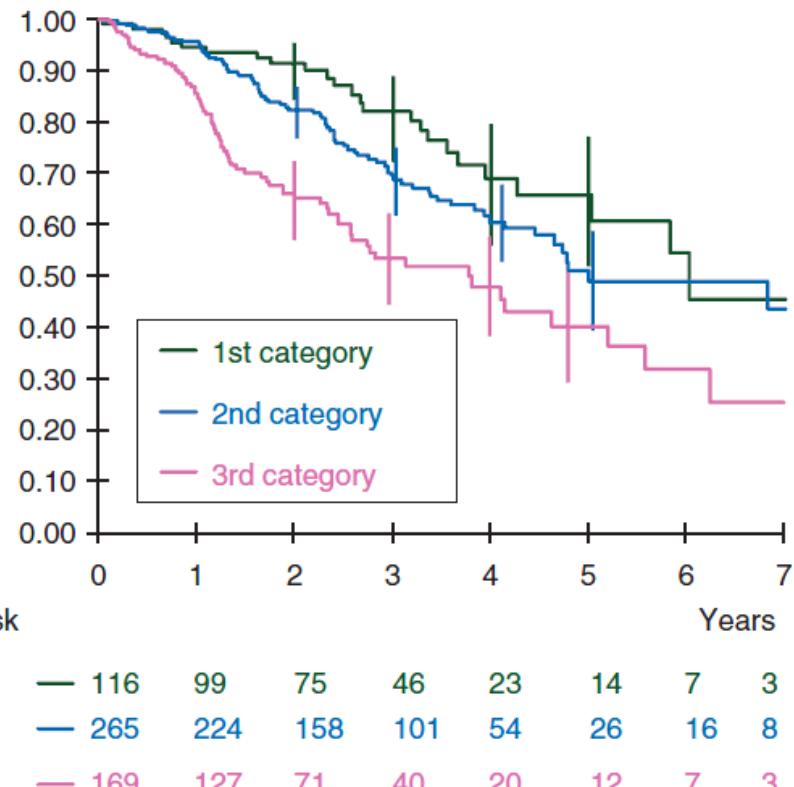


Figure 1. Overall survival rate in the complete population according to 3-category OS prognostic score based on the 4 OS prognostic factors: primary disease other than colon or kidney, DFI less or equal to 1 year, size higher than 2 cm, more than two lung metastases. 1st category: no unfavorable factor. 3rd category: at least one of the disease factors (primary disease other than colon or kidney or DFI less or equal to 1 year) and one of the lung metastasis factors (size higher than 2 cm or more than two lung metastases). 2nd category: the others.

Consideration of Non-CRC Lung Metastases

Published 5-year survival rates after resection of metastases from:

HCC: 37-41%

Esophageal cancer: 34%

RCC: 45%

Yoon YS, et al. *Ann Surg Oncol.* 2010;17:2795-2801.

Kitano K, et al. *Eur J Cardiothorac Surg.* 2012;41:376-382.

Kobayashi N, et al. *Ann Surg Oncol.* 2014;21:S365-9

Alt AL, et al. *Cancer.* 2011;117:2873-82

Omae K, et al. *J Vasc Interv Radiol.* 2016;27(9):1362-1370.

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Table 3. Results of Survival of the Patients with Lung Oligometastasis from Each Type of Primary Lesion Treated with RF Ablation

Primary	Cancer	No. of Pts.	Overall Survival										Recurrence-Free Survival										
			Follow-up (mo)		Rate (%)					Time (mo)		Rate (%)					Time (mo)		Rate (%)		Time (mo)		
			Median	Mean	1 y	2 y	3 y	4 y	5 y	P Value*	Median	Mean	1 y	2 y	3 y	4 y	5 y	P Value*	Median	Mean	1 y	2 y	3 y
CRC	CRC	52	50	55	98	89	84	76	70	.042 [†]	NR	93	56	43	35	30	30	.46	15	47	58	43	35
NSCLC	NSCLC	33	54	59	97	84	76	68	61	.71	90	80	63	32	28	25	16	.59	15	33	88	75	38
HCC	HCC	16	26	45	94	66	66	66	66	.85	121	85	47	40	40	32	32	.67	11	32	88	75	38
EC	EC	14	35	42	93	77	62	44	33	.022 [†]	42	50	50	36	29	29	19	.47	6	29	88	75	38
RCC	RCC	8	43	49	100	100	70	70	47	.58	58	60	88	75	38	25	25	.43	29	41	88	75	38
All		123	46	53	95	83	76	68	62	–	90	82	58	41	33	28	25	–	17	41	88	75	38

CRC = colorectal cancer; EC = esophageal cancer; HCC = hepatocellular carcinoma; NR = not reached; NSCLC = non-small-cell lung cancer; RCC = renal cell carcinoma; RF = radiofrequency.

*Survival rates were compared between the corresponding cancer and the other four types with the log-rank test.

[†]Statistically significant.

Conclusions

- Careful pre-procedural planning – patient and energy selection are keys to good outcomes and risk mitigation
- Percutaneous lung ablation is effective and a favorable area for practice building
 - Large patient series support the use of resection or ablation for CRC patients with lung metastases
 - Equivalence for stringently selected patients
 - Expands options for non-operative patients
 - Lung sparing
- Multidisciplinary consideration for timing of therapy may maximize benefits for patients