

Thermal-ablation techniques: a curative treatment of bone metastases in selected patients?

Curative thermal-ablation of Bone Mets (BM)

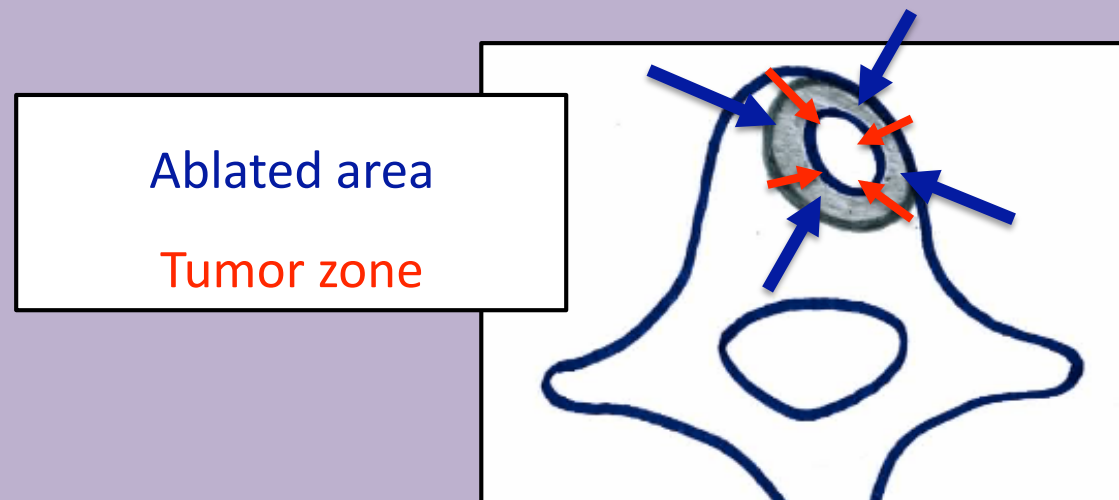
- Single center, retrospective analysis
- All consecutive patients who had undergone curatively intended RFA/CRYO of BMs (*sept. 2001-fev. 2012*)
 - (Cryo available since april 2009)*
- Gp-1: « oligometastatic » patients
 - (<5 mets besides the primary tumor)*
 - Cure all the bone metastases (strategy= no evidence of residual disease)
- Gp-2: patients with long life expectancy despite several bone mets
 - Cure only the bone metastases that could potentially lead to skeletal-related events (SRE)

Curative thermal-ablation of Bone Mets (BM)

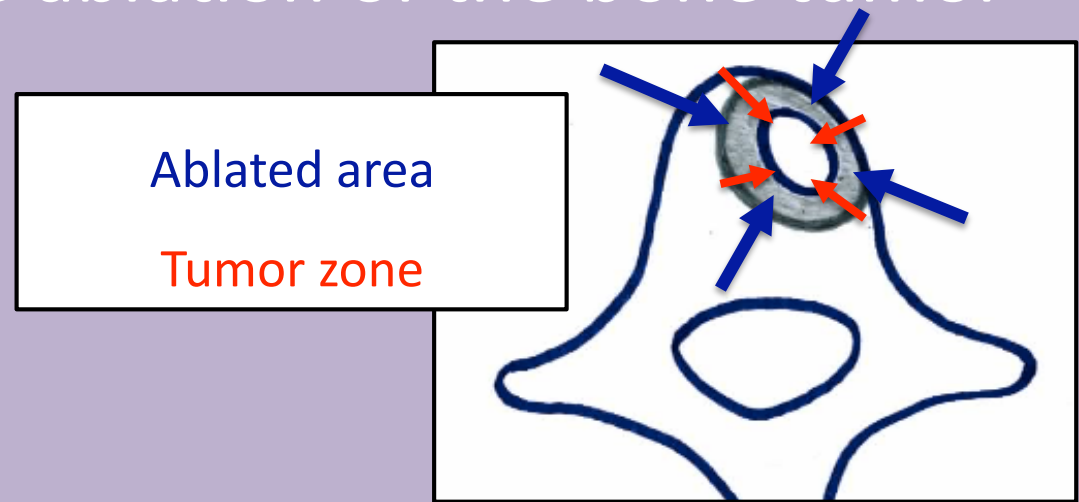
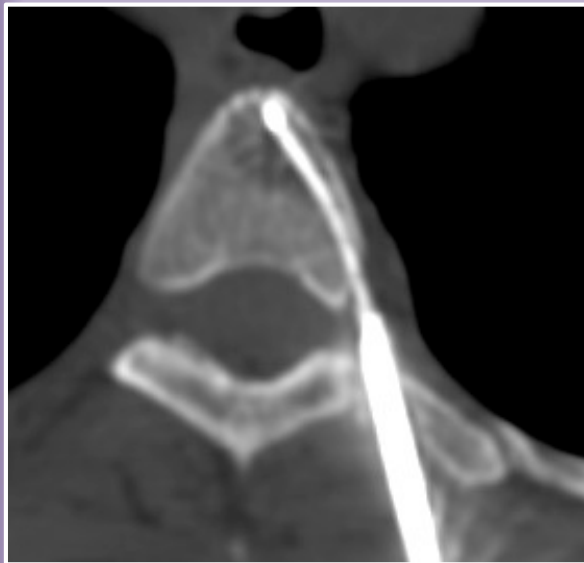
- Retrospective review of post-ablation imaging (CT, MRI, PET-CT)

Criteria for local control success:

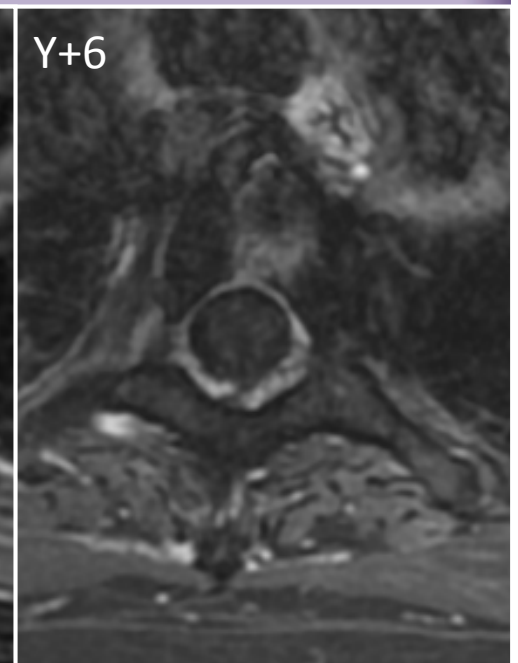
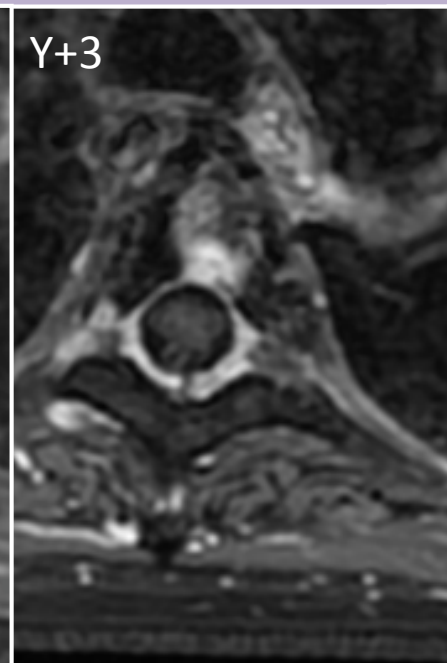
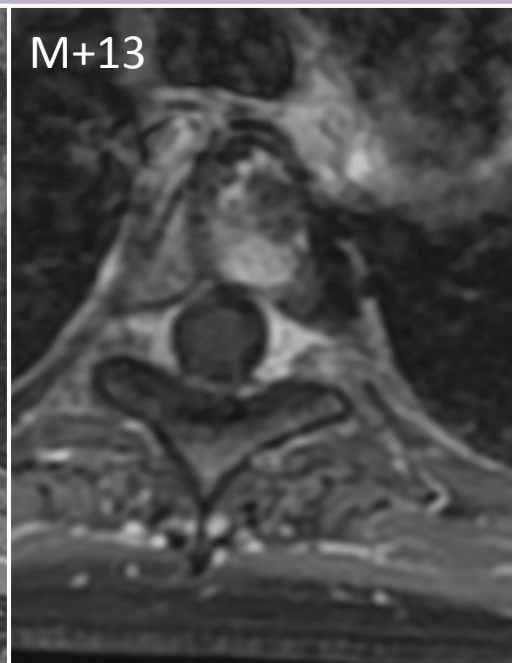
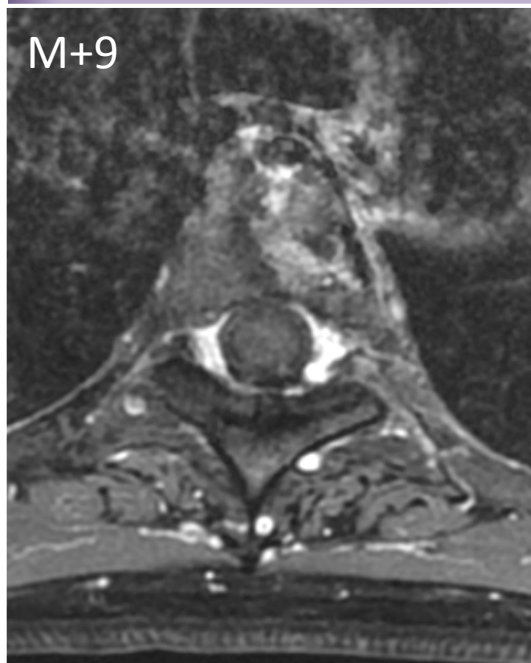
- *Tumour zone: stable size, no contrast uptake*
- *Ablated area: encompass the entire tumor zone*

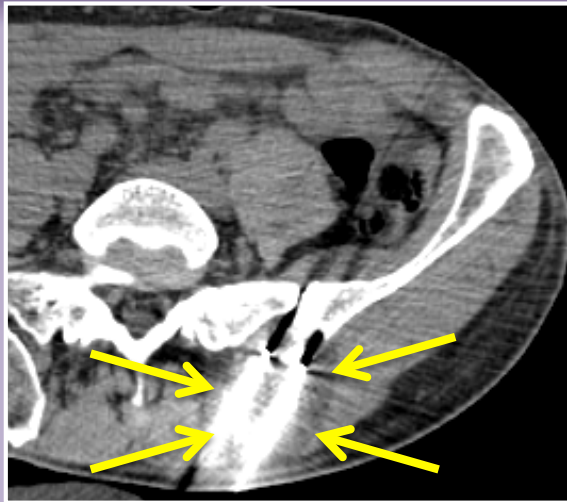
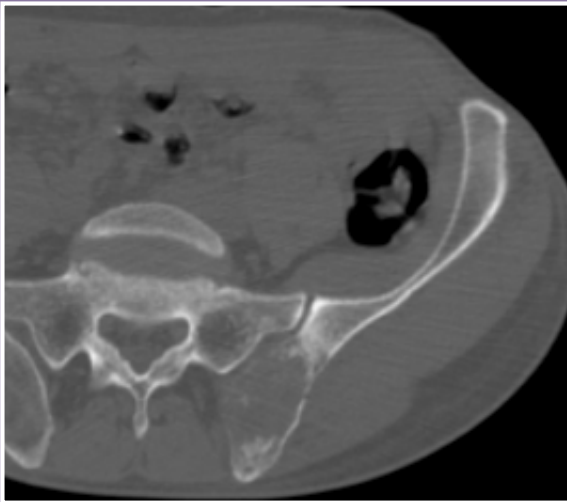


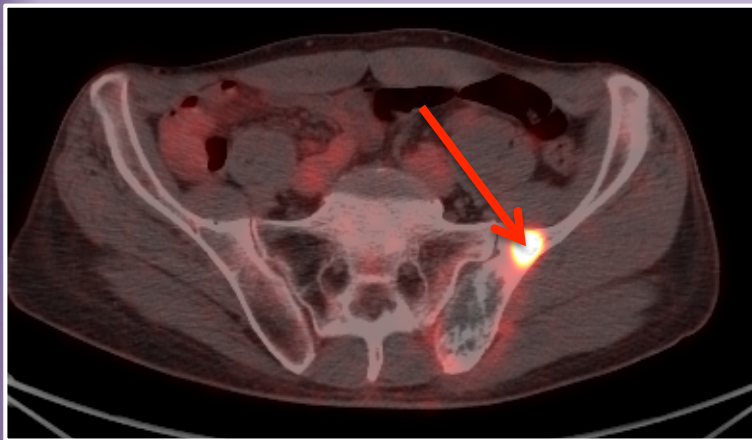
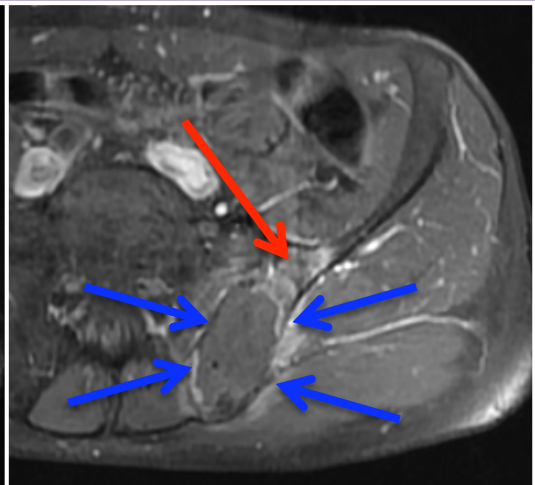
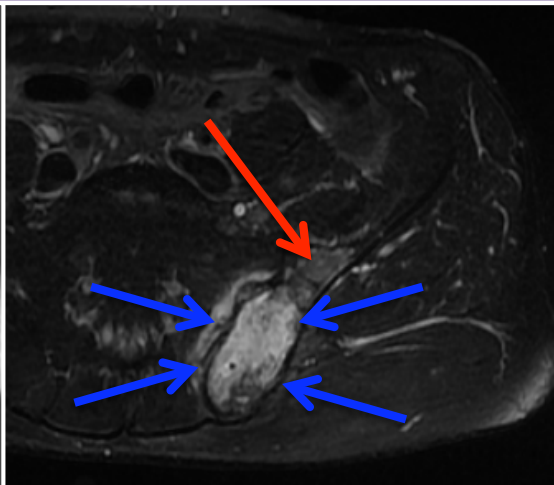
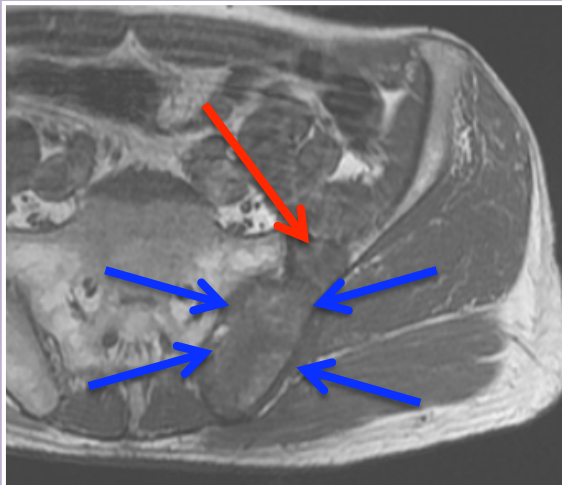
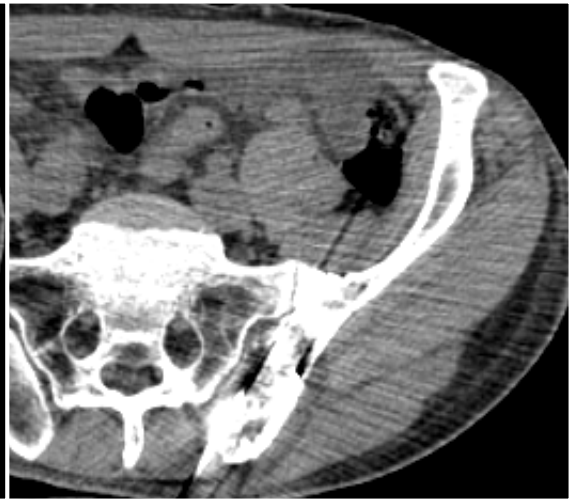
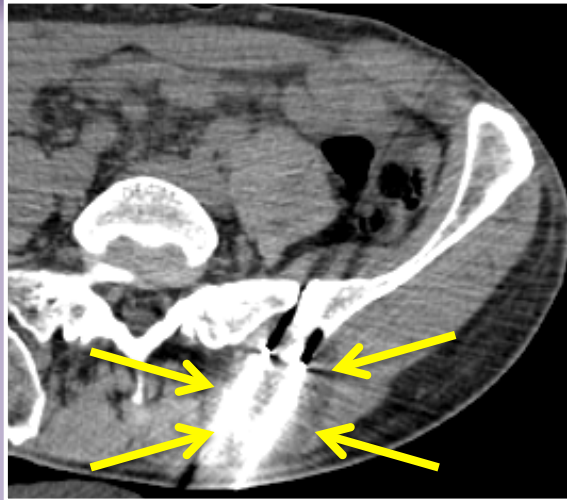
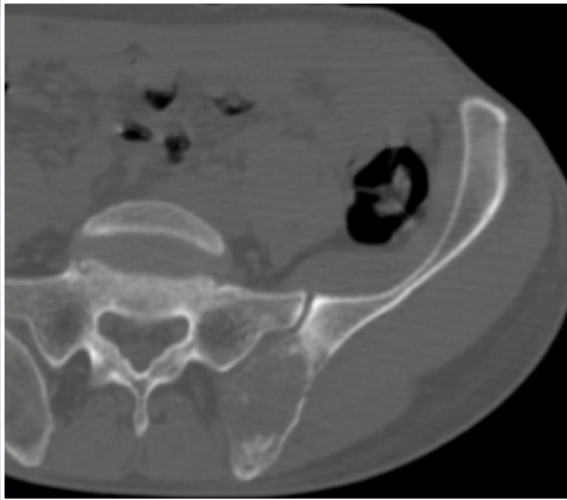
Criteria for complete ablation of the bone tumor



50 yo female, pheochromocytoma







Curative thermal-ablation of Bone Mets (BM)

- Rate of local control at 1 year/ BM
- Pronostic factors for local control:

- Patient's characteristics

- Age
- Sexe
- Site of the primary tumor

- BM's characteristics

- Synchronicity with the primary tumor
- Previous external radiotherapy
- Maximal diameter
- Progression within previous 3 months
- Lytic/ Sclerotic
- Bone cortical erosion
- Neurological structure in the vicinity (<1 cm)

- RFA/ Cryo.

- Bone Disease Free Survival (B-DFS) in gp-1 patients

Results

89 consecutive patients had undergone curatively intended thermal-ablation of 122 bone metastases

Patients' characteristics		n=
Number of patients		89
Gender	Male	44 (49%)
	Female	45 (51%)
Mean (sd) Age at diagnosis, years		48 (16)
Site of the primary tumor	Breast	18 (20%)
	Kidney	17 (19%)
	Thyroid	14 (16%)
	Neuroendocrine tumor/ Pheochromocytoma	14 (16%)
	Others*	26 (29%)

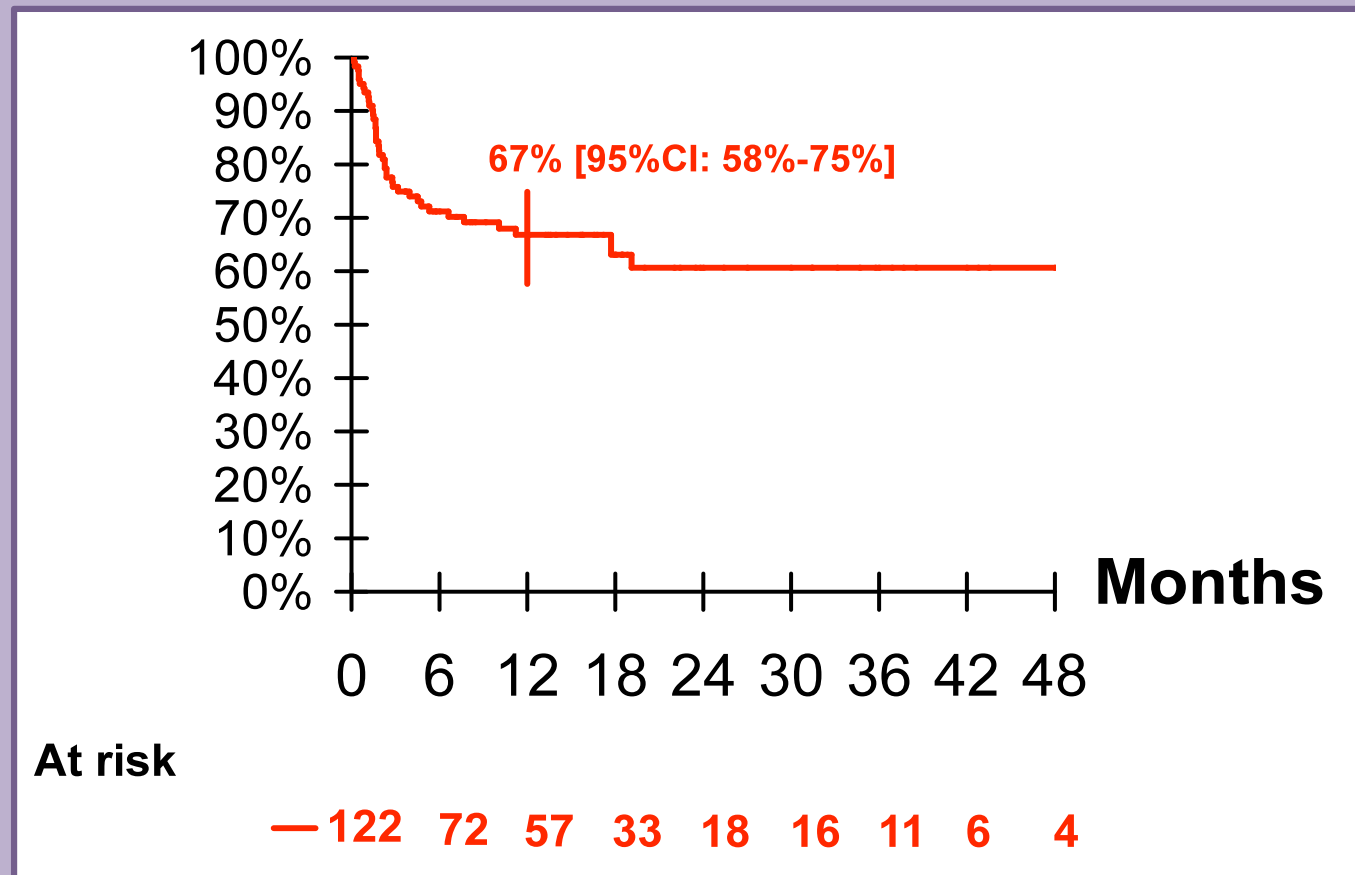
* Sarcoma (5), colorectal (4), prostate (3), melanoma (3), pulmonary (3) and others less than 3

Results

Bone metastases' characteristics		Overall n=122	Group-1 n=69	Group-2 n=53	P-value
Synchronicity with the primary tumor		36 (30%)	19 (28%)	17 (32%)	0.6
Previous external radiotherapy		22 (18%)	17 (25%)	5 (9%)	0.03
Maximal diameter at CT	<i>< 20 mm</i>	48 (39%)	29 (42%)	19 (36%)	0.7
	<i>20-29 mm</i>	26 (21%)	13 (19%)	13 (25%)	
	<i>≥ 30 mm</i>	48 (39%)	27 (39%)	21 (40%)	
Bone metastasis progression within previous 3 months	<i>No progression</i>	78 (64%)	50 (72%)	28 (53%)	0.03
	<i>Progression</i>	44 (36%)	19 (28%)	25 (47%)	
Condensation aspect at CT	<i>Lytic</i>	96 (79%)	53 (77%)	43 (81%)	0.6
	<i>Sclerotic</i>	26 (21%)	16 (23%)	10 (19%)	
Bone cortical erosion		52 (43%)	25 (36%)	27 (51%)	0.1
Neurological structure in the vicinity		47 (39%)	26 (38%)	21 (40%)	0.8
Thermal-ablation technique	<i>RFA</i>	74 (61%)	41 (59%)	33 (62%)	0.7
	<i>Cryo.</i>	48 (39%)	28 (41%)	20 (38%)	

Results

Median follow-up was 22.8 months [IQR=12.2 to 44.4 months]



Rates of local control at 1 year: 67% [95%CI: 58%-75%]

Prognostic factors for local incomplete treatment

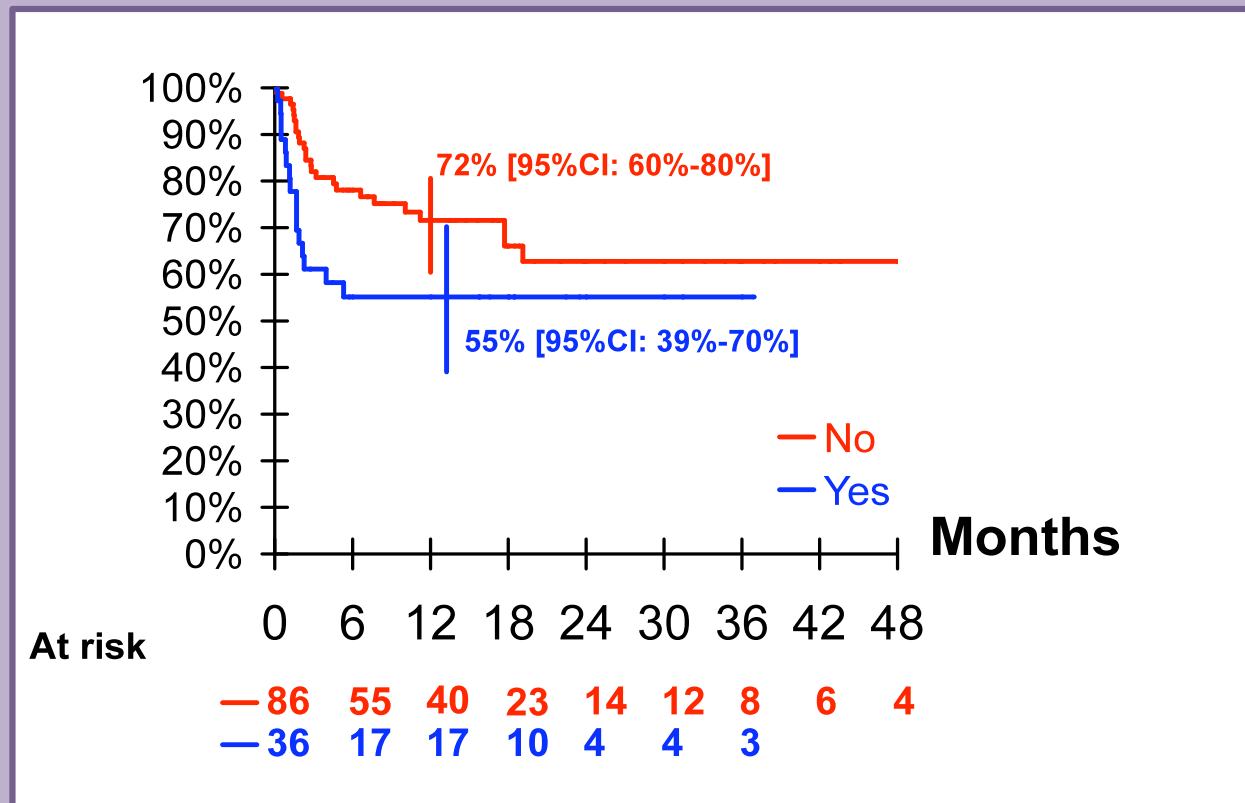
Treatment failure according Patients' characteristics		HR	P-value
Gender	<i>Male</i>	1	0.02
	<i>Female</i>	0.7 [0.4 - 1.2]	
Age at diagnosis (per additional year)		1.02 [0.99 - 1.04]	0.1
Site of the primary tumor	<i>Others</i>	1	0.09
	<i>Breast</i>	0.9 [0.3 - 2.4]	
	<i>Kidney</i>	2.6 [1.1 - 6.3]	
	<i>Thyroid</i>	0.7 [0.3 - 2.0]	
	<i>Pheochromocytoma</i>	1.6 [0.7 - 3.6]	

Prognostic factors for local incomplete treatment

Bone metastases' characteristics	P Values		
	Uni-	Multivariate	HR (95% CI)
Synchronicity with the primary tumor	0.07	0.004	2.7 [1.4 - 5.3]
Previous external radiotherapy	0.5		
Maximal diameter at CT	<i>< 20 mm</i>		1
	<i>20-29 mm</i>	<0.0001	1.8 [0.6 - 5.3]
	<i>≥ 30 mm</i>		5.2 [2.2 - 13]
Bone metastasis progression within previous 3 months	<i>No progression</i>	0.04	1
	<i>Progression</i>		2.6 [1.0 - 6.7]
Condensation aspect at CT	<i>Sclerotic</i>	0.2	
	<i>Lytic</i>		
Bone cortical erosion	0.0001	0.01	2.6 [1.3 - 5.2]
Neurological structure in the vicinity	0.07	0.002	2.8 [1.5 - 5.3]
Thermal-ablation technique	<i>RFA</i>	0.03	
	<i>Cryo.</i>		

Local control after thermal-ablation

Synchronicity with the primary tumor



Local control at 12 months

Multivariate analysis

Synchronous

55%

1

Metachronous

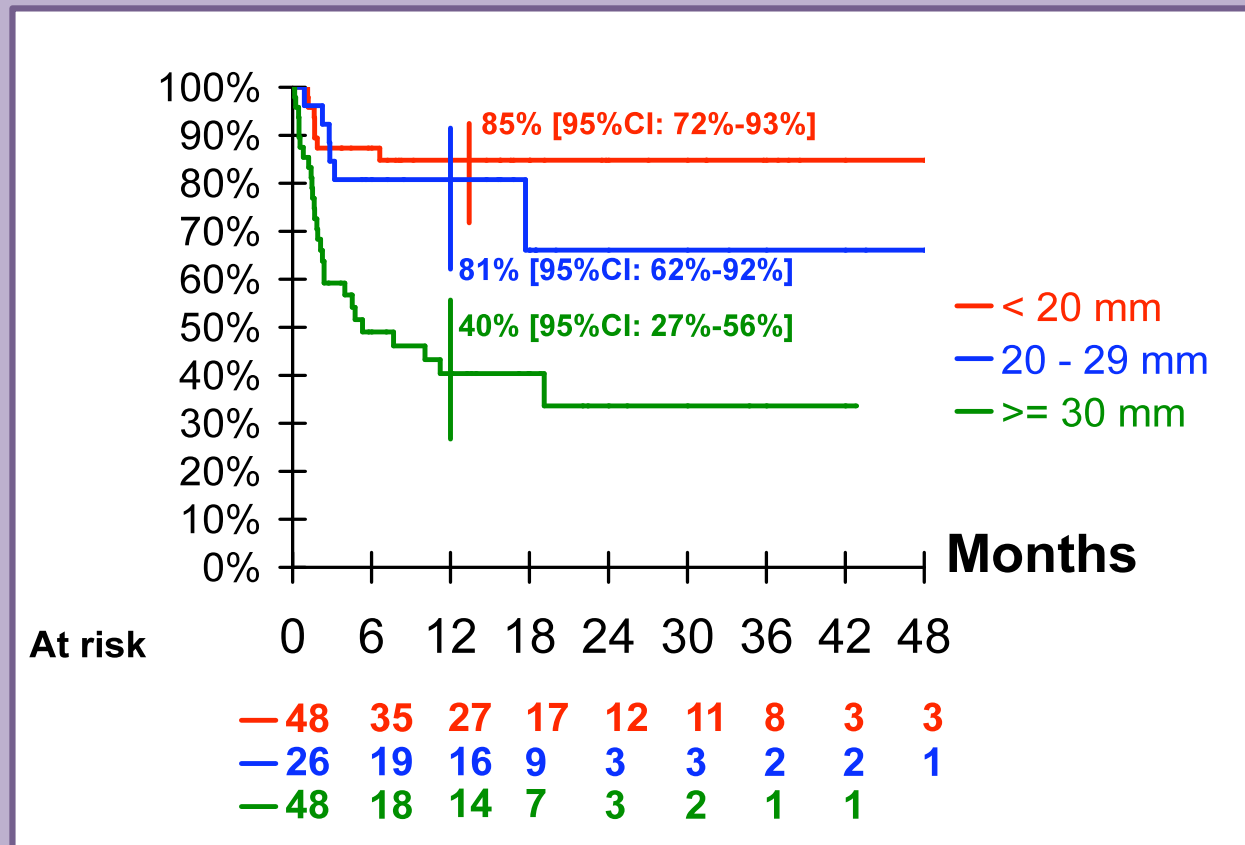
72%

HR= 2.7 [95% CI: 1.4 - 5.3]

p= 0.004

Local control after thermal-ablation

Maximal diameter at CT



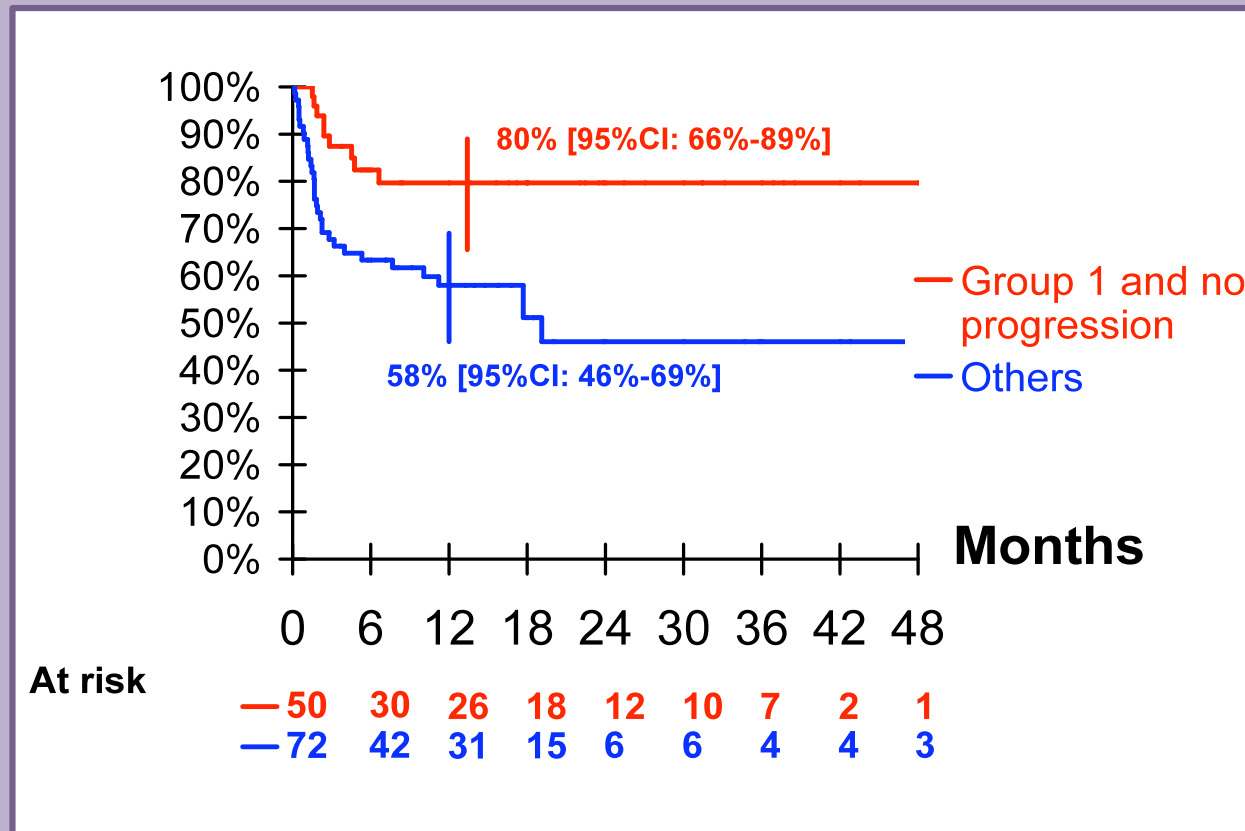
Local control at 12 months

Multivariate analysis

< 20 mm	85%	1	
20-29 mm	81%	HR= 1.8 [95% CI: 0.6 - 5.3]	p= 0.001
≥ 30 mm	40%	HR= 5.2 [95% CI: 2.2 - 13]	

Local control after thermal-ablation

Bone metastasis progression within previous 3 months



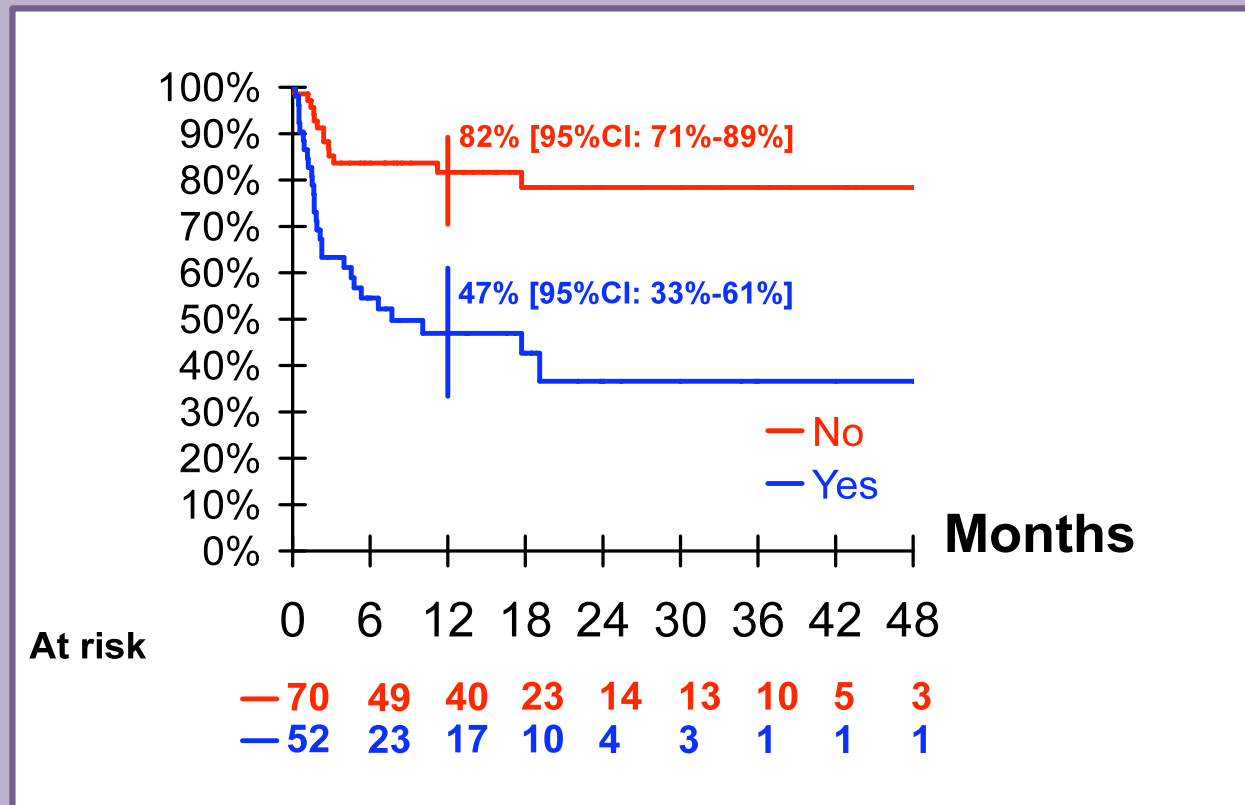
Local control at 12 months

Multivariate analysis

Progression within 3 months before	Yes	58%	1	p= 0.04
	No	80%	HR= 2.6 [95% CI: 1.0 – 6.7]	

Local control after thermal-ablation

Bone cortical erosion



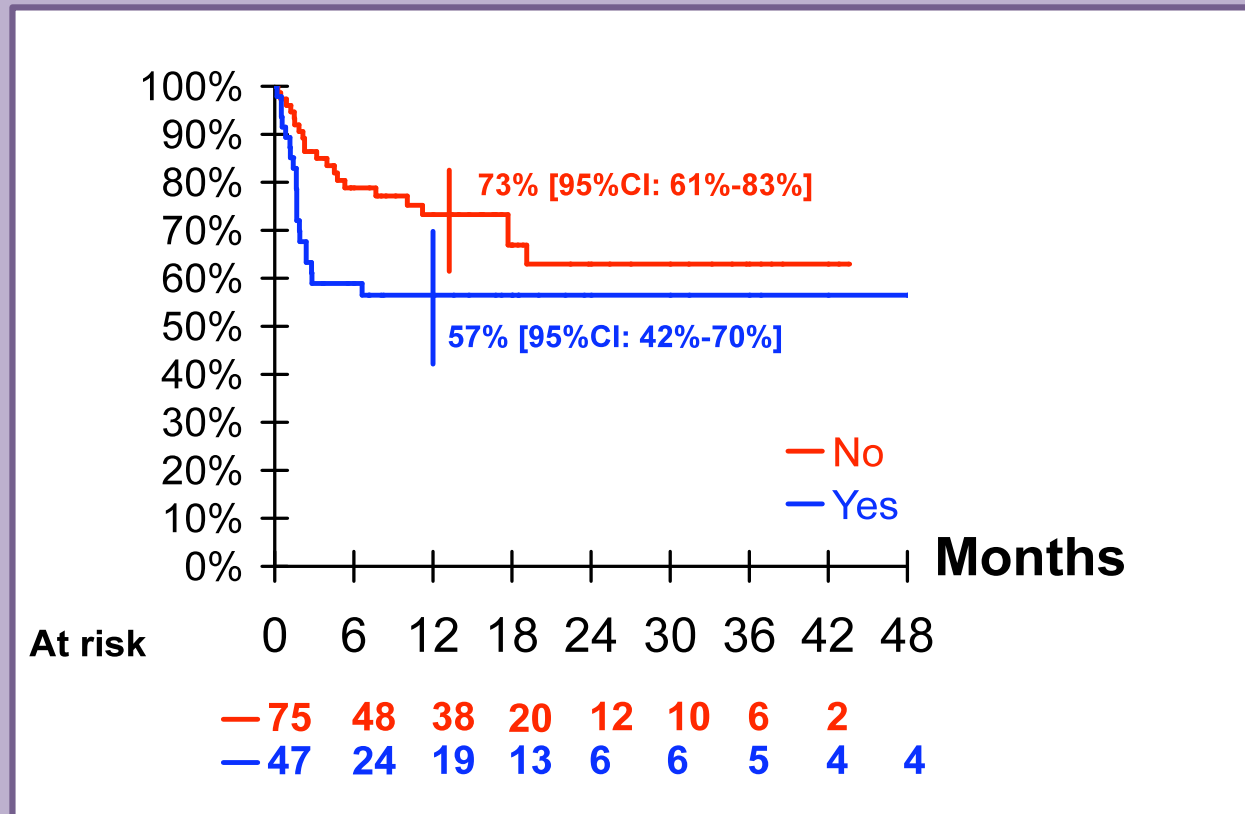
Local control at 12 months

Multivariate analysis

Bone cortical erosion	Yes	47%	1	p= 0.01
	No	82%	HR= 2.6 [95% CI: 1.3 – 5.2]	

Local control after thermal-ablation

Neurological structure in the vicinity

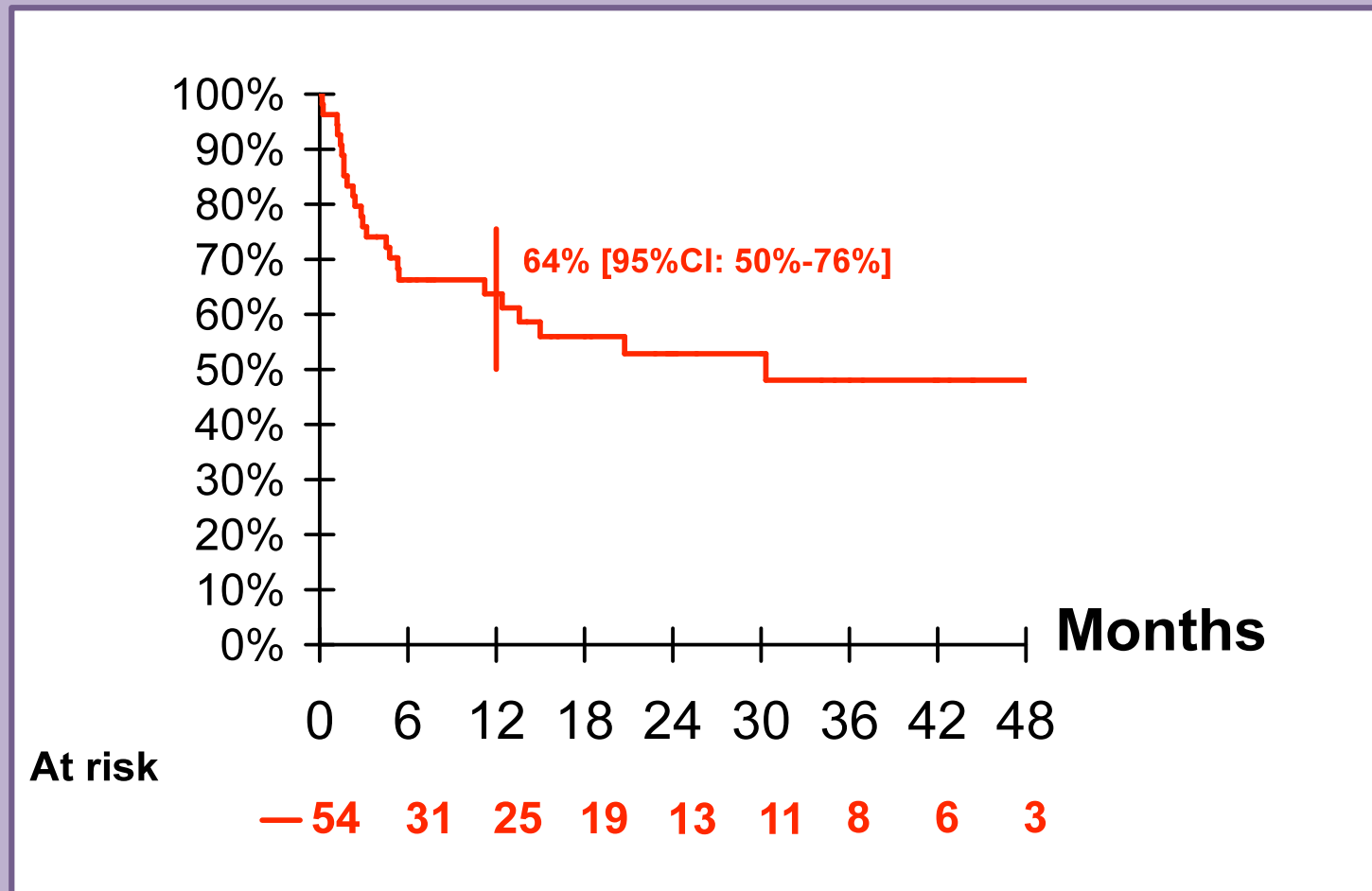


Local control at 12 months

Multivariate analysis

Neurological structure <1cm	Yes	57%	1	p= 0.002
	No	73%	HR= 2.8 [95% CI: 1.5 – 5.3]	

Median follow-up was 22.8 months [IQR=12.2 to 44.4 months]



Bone DFS at 1 year after thermal-ablation of all BMs (gp-1) : 64%

[95%CI: 50%-76%]

CONCLUSION

Thermal-ablation must be considered as part of the therapeutic arsenal to cure bone metastases, especially

- metachronous bone mets
- maximal diameter <2 cm
- No progression within 3 months
- No bone cortical erosion
- No neurological structure in the vicinity