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Società Italiana di Ecografia  
in Medicina e Chirurgia

II CORSO NAZIONALE E  
SEMINARI DI  
ECOGRAFIA CLINICA  
SIEMC



RIMINI,  
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AQUA HOTEL + ARIA HOTEL

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**Trattamento delle lesioni focali epatiche maligne**

[Radiol Clin North Am.](#) 2015 Sep;53(5):933-71.

## **Liver Ablation: Best Practice.**

[Wells SA](#), [Hinshaw JL](#), [Lubner MG](#), [Ziemlewicz TJ](#), [Brace CL](#), [Lee FT Jr.](#)

- **Tumor ablation in the liver has evolved to become a well-accepted tool in the management of increasing complex oncologic patients.**
- **At present, percutaneous ablation is considered first-line therapy for very early and early hepatocellular carcinoma**  
***and second-line therapy for colorectal carcinoma liver metastasis.***

# ABLATION TECHNIQUES AVAILABLE

**CHEMICAL : 95% ALCOHOL**

***PHISICAL : Heat***

***THERMAL : Radiofrequency, laser, hifu,***

***NON THERMAL : Irreversible Electroporation***

J Clin Exp Hepatol. 2014

# **Role of local ablative therapy for hepatocellular carcinoma**

Thandassery RB, Goenka U, Goenka MK

Percutaneous local ablation (PLA) techniques are safe, **minimally invasive, efficacious and cost-effective**

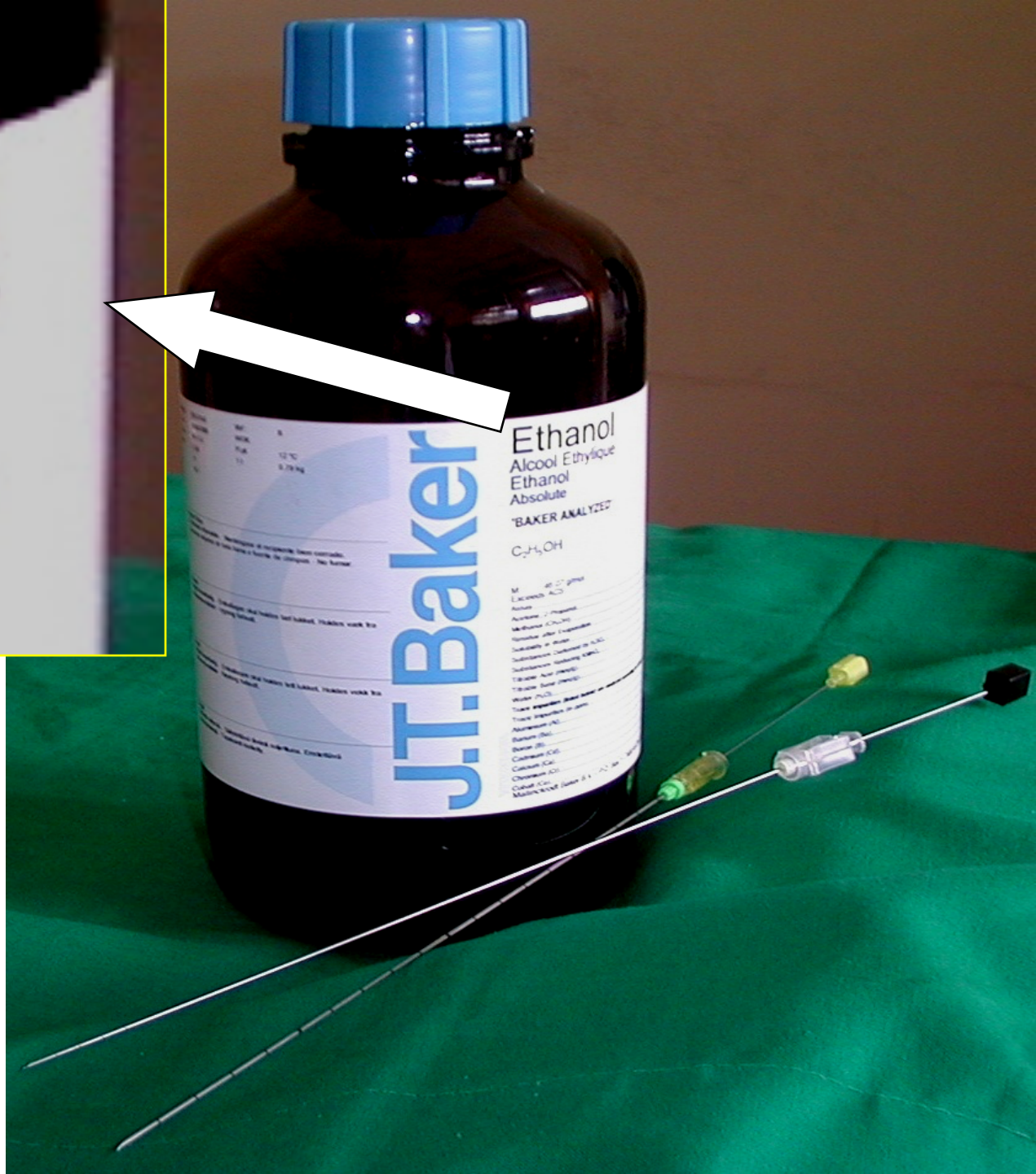
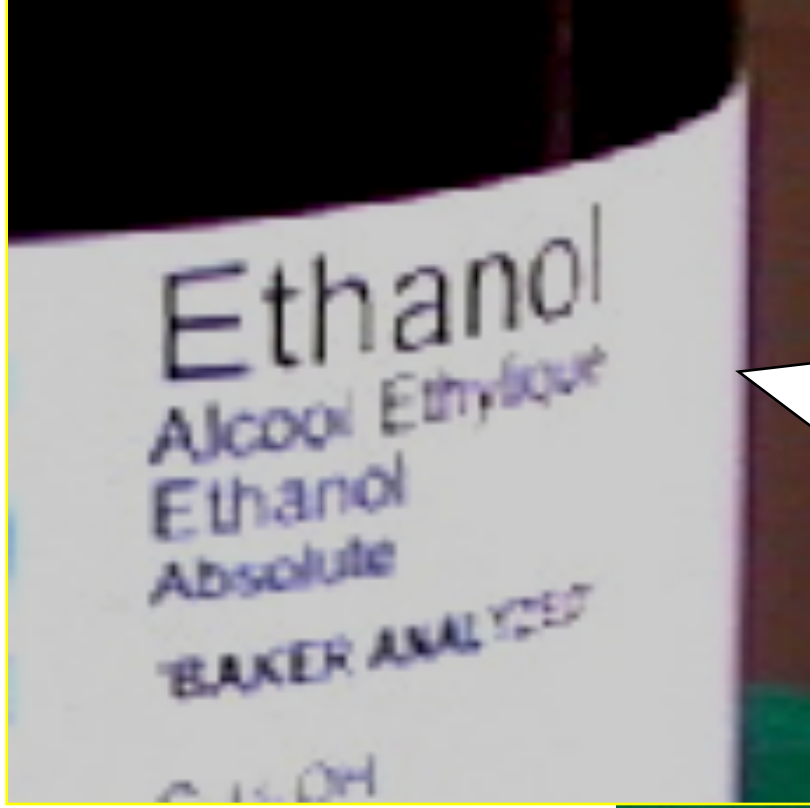
- **Radiofrequencyablation (RFA) is considered as the first line treatment in some centers, though most of the guidelines recommend it for small HCCs, where surgical resection is not feasible.**

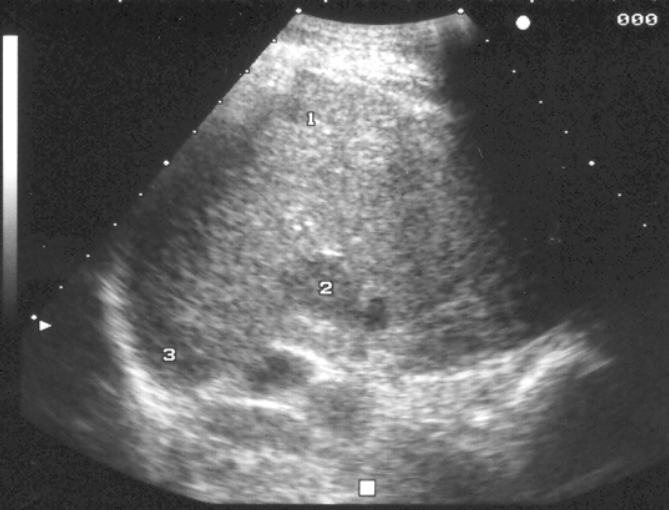
**In developing countries percutaneous ethanol injection (PEI) and percutaneous acetic acid injection (PAI) may be used instead of RFA.**

***For large HCCs, advances in electrode designs and newer techniques of ablation, including microwave ablation, are increasingly being used.***

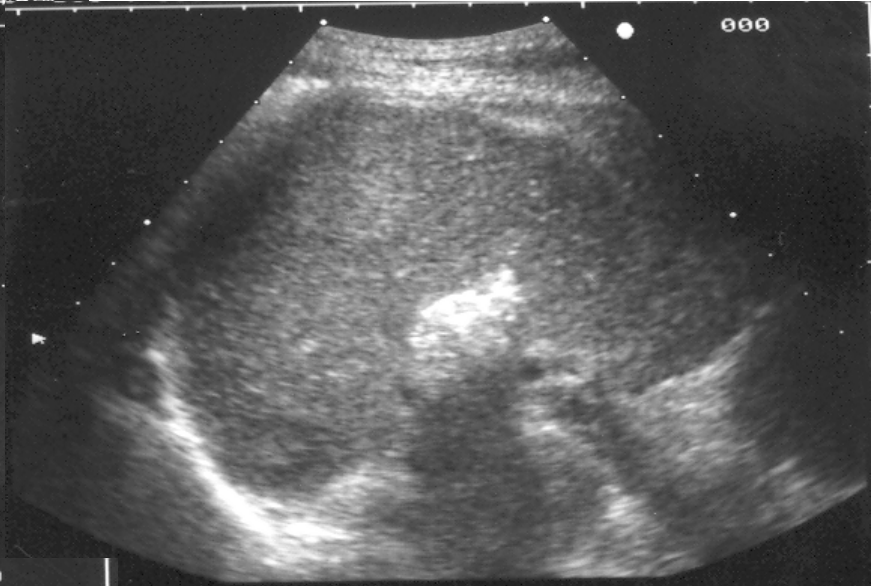
Combination treatment modalities have shown promising results as compared to single modality for large tumors.

- ***The selection of the most appropriate modality depends on the size, number of lesions, the liver function status, patient's financial resources, availability of a particular technique and the expertise available.***





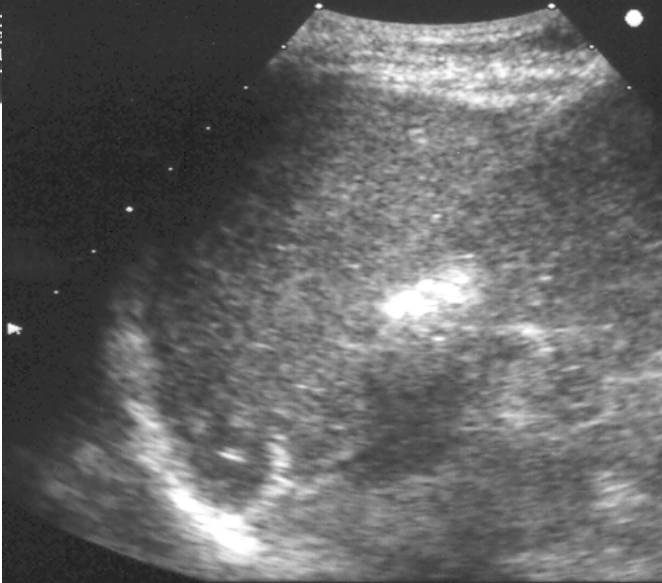
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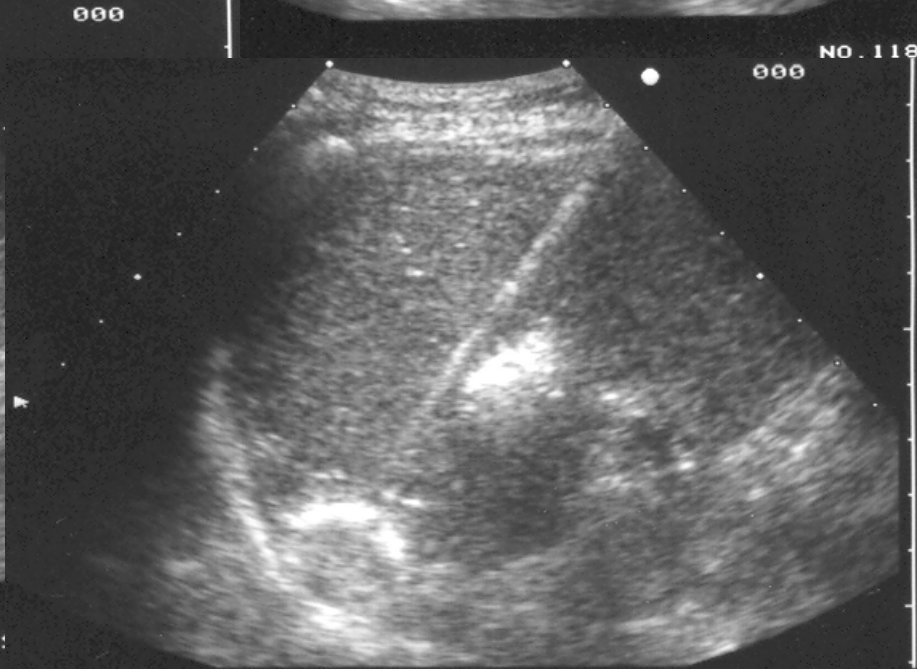
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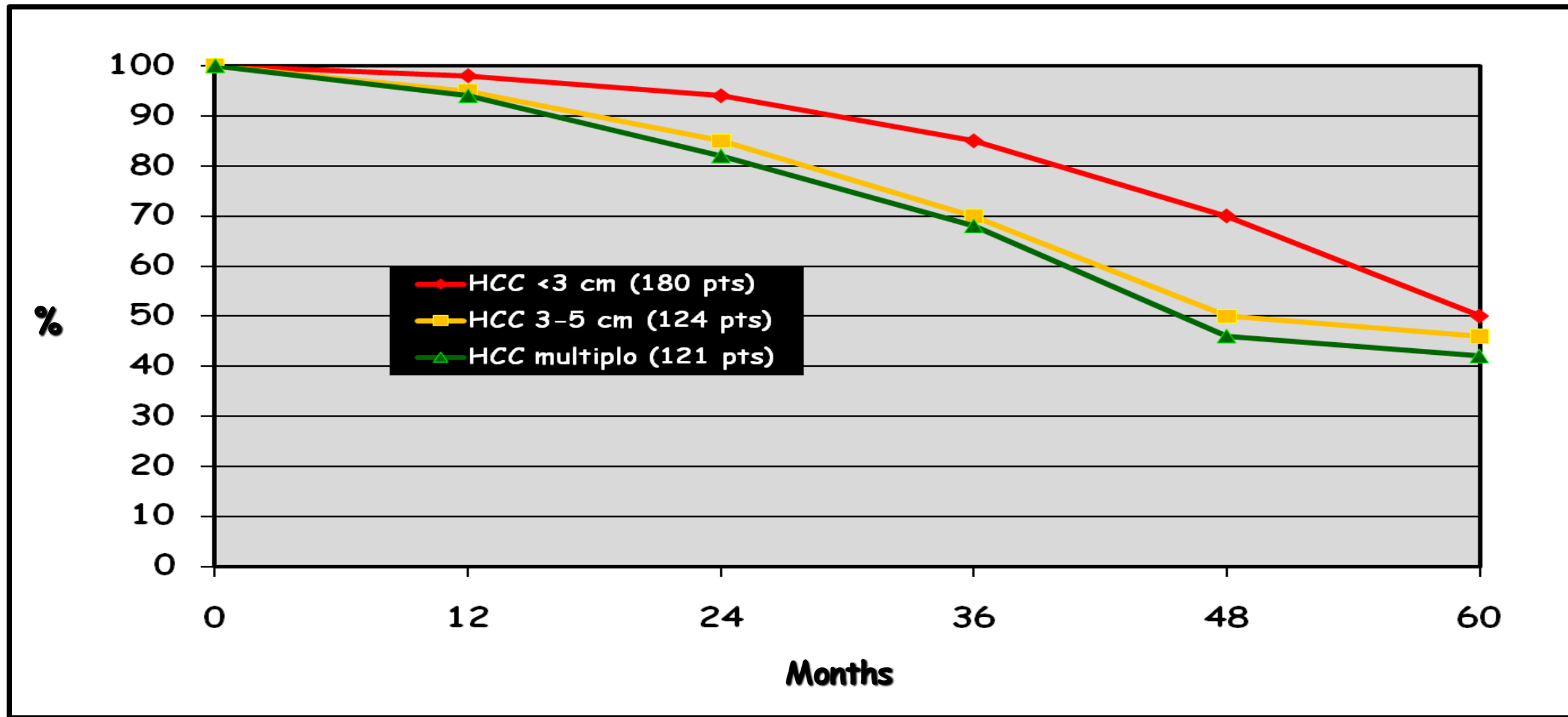
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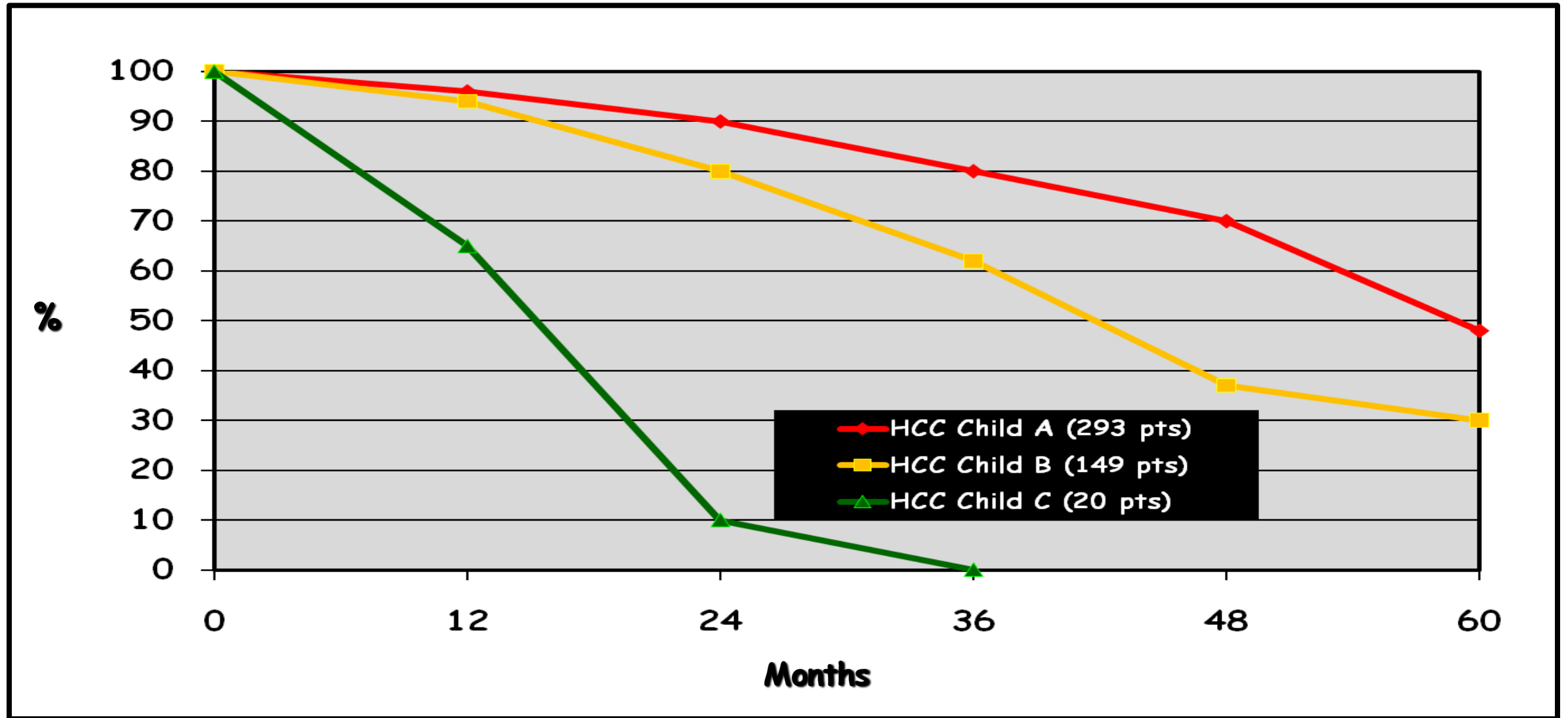


# Hepatocellular Carcinoma and Cirrhosis in 746 Patients: Long-term Results of Percutaneous Ethanol Injection



Livraghi T, Giorgio A. Radiology 1995

# Hepatocellular Carcinoma and Cirrhosis in 746 Patients: Long-term Results of Percutaneous Ethanol Injection



Livraghi T, Giorgio A. Radiology 1995

Sustained complete response and complications rates after radiofrequency ablation of very early hepatocellular carcinoma in cirrhosis: Is resection still the treatment of choice?

*Hepatology Jan 2008 - Livraghi T. et al*

218 pts with single HCC  $\leq$  2.0 cm (very early or T1 stage) underwent RFA.

After a median follow-up of 31 months, sustained complete response was observed in 216 patients (97.2%)

Peri-operative mortality, major complication, and 5-year survival rates were 0%, 1.8%, and 68.5%, respectively Af

RF ablation vs PEI for small HCC in cirrhosis:  
meta-analysis of randomized controlled trials.

Orlando A et al. Am J Gastroenterol 2009

*"RF improves 3-year survival"*

Systematic review of randomized trials for HCC  
treated with percutaneous ablation therapies

Cho YK et al. Hepatology 2009

*"nevertheless there is no evidence favoring RFA for lesions < 2cm"*

Meta-analysis of percutaneous radiofrequency ablation  
versus ethanol injection in HCC

Bouza C et al. BMC Gastroenterology 2009

*"overall cost-effectiveness of RFA needs further evaluation"*

Clinical outcome of RF, PEI and acetic acid for HCC: a meta-analysis

Germani G et al. J Hepatol 2010

*RF > PEI > 2 cm (seems)*

*PEI=RF < 2cm*

*"emerging economies"*

# **Ablation for hepatocellular carcinoma: is there a need to have a winning technique?**

**that the assumption of RF as the first line technique is not incorrect, but this not means that ethanol injection is to be dismissed**

**Does this mean that ethanol injection is not useful?  
NOT AT ALL !**

**In HCC < 2 cm both ethanol injection and RFA are highly effective. Some tumors are located at risk sites and RFA treatment can incur severe complications. In addition, in tumors larger than 2 cm in size, initial RF may leave a tiny nest of viable tissue that can be easily treated with alcohol**

**Forner A, Bruix J. Jhepatol 2010**

[Anticancer Res.](#) 2015 Jan;35(1):325-32.

## **Single hepatocellular carcinoma smaller than 2 cm: are ethanol injection and radiofrequency ablation equally effective?**

[Pompili M](#)<sup>1</sup>, [De Matthaeis N](#)<sup>2</sup>, [Saviano A](#)<sup>2</sup>, [De Sio I](#)<sup>3</sup>, [Francica G](#)<sup>4</sup>, [Brunello F](#)<sup>5</sup>, [Cantamessa A](#)<sup>5</sup>, [Giorgio A](#)<sup>6</sup>, [Scognamiglio U](#)<sup>6</sup>, [Fornari F](#)<sup>7</sup>, [Giangregorio F](#)<sup>7</sup>, [Piscaglia F](#)<sup>8</sup>, [Gualandi S](#)<sup>8</sup>, [Caturelli E](#)<sup>9</sup>, [Roselli P](#)<sup>9</sup>, [Riccardi L](#)<sup>2</sup>, [Rapaccini GL](#)<sup>2</sup>.

**Two hundred forty-four cirrhotics with single HCC  $\leq$  2 cm treated with PEI (108 cases) or RFA (136 cases) were enrolled in the study. Eighty-one patients in each group were selected for propensity score matching analysis.**

The **five-year survival was not significantly different (64.7% in PEI and 72.9% in RFA group)** but the 5-year recurrence (73.3% in PEI and 49% in RFA group,  $p=0.023$ ) and local tumor progression (49% in PEI and 30.1% in RFA group,  $p=0.018$ ) were higher in the PEI group.

**PEI and RFA are equally effective in treating HCCs smaller than 2 cm in terms of 5-year survival, despite higher cumulative and local recurrence rates, in patients treated with PEI.**

[J Hepatol](#). 2013 Jul;59(1):89-97.

**Long-term effectiveness of resection and radiofrequency ablation for single hepatocellular carcinoma  $\leq 3$  cm. Results of a multicenter Italian survey.**

[Pompili M<sup>1</sup>](#), [Saviano A](#), [de Matthaeis N](#), [Cucchetti A](#), [Ardito F](#), [Federico B](#), [Brunello F](#), [Pinna AD](#), [Giorgio A](#), [Giulini SM](#), [De Sio I](#), [Torzilli G](#), [Fornari F](#), [Capussotti L](#), [Guglielmi A](#), [Piscaglia F](#), [Aldrighetti L](#), [Caturelli E](#), [Calise F](#), [Nuzzo G](#), [Rapaccini GL](#), [Giuliente F](#).



The study involved **544 Child-Pugh A cirrhotic patients (246 in the resection group and 298 in the radiofrequency group)** observed in 15 Italian centers.

#### **RESULTS:**

Two cases of perioperative mortality were observed in the resection group and the rate of major complications was 4.5% in the resection group and 2.0% in the radiofrequency group ( $p=0.101$ ).

**Four-year overall survival rates were 74.4% in the resection group and 66.2% in the radiofrequency group ( $p=0.353$ ).**

Four-year cumulative HCC recurrence rates were 56% in the resection group and 57.1% in the radiofrequency group ( $p=0.765$ ).

Local tumor progression was detected in 20.5% of ablated patients and in one resected patient ( $p<0.001$ ).

**After propensity score matching, both survival and tumor recurrence were still not significantly different although a trend towards lower recurrence was observed in resected patients.**

#### **CONCLUSIONS:**

In spite of a higher rate of local tumor progression, radiofrequency ablation can provide results comparable to liver resection in the treatment of single hepatocellular carcinoma  $\leq 3$  cm occurring in compensated cirrhosis.

[Dig Liver Dis.](#) 2013 Apr;45(4):336-41.

## **Long-term effectiveness of radiofrequency ablation for solitary small hepatocellular carcinoma: a retrospective analysis of 363 patients.**

[Francica G<sup>1</sup>](#), [Saviano A](#), [De Sio I](#), [De Matthaeis N](#), [Brunello F](#), [Cantamessa A](#), [Giorgio A](#), [Scognamiglio U](#), [Fornari F](#), [Giangregorio F](#), [Piscaglia F](#), [Gualandi S](#), [Caturelli E](#), [Roselli P](#), [Rapaccini GL](#), [Pompili M](#).

Data of **365 patients (59% males; mean age 67 ± 8 years), Child-Pugh A/B, with single Hepatocellular Carcinoma nodule ≤3 cm** (tumours >2-3 cm = 127/236), showing complete necrosis after Radiofrequency Ablation between 1998 and 2010 in 7 Italian Centers were retrospectively reviewed. Complication, overall survival and disease-free survival rates were analyzed as main clinical end-points.

### **RESULTS:**

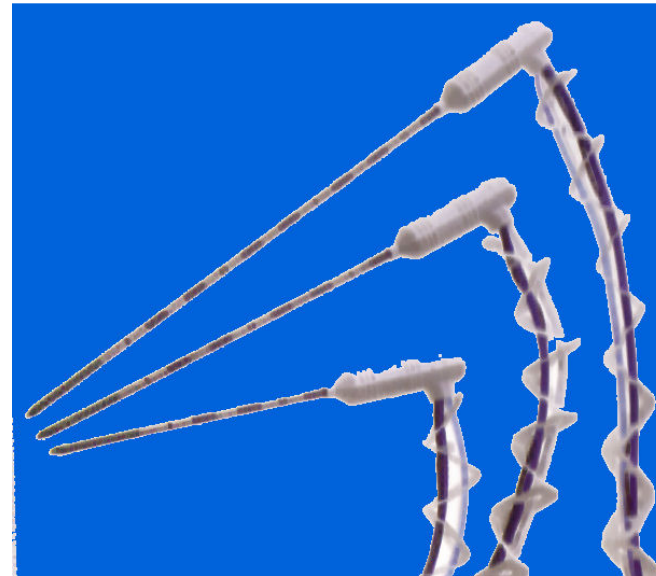
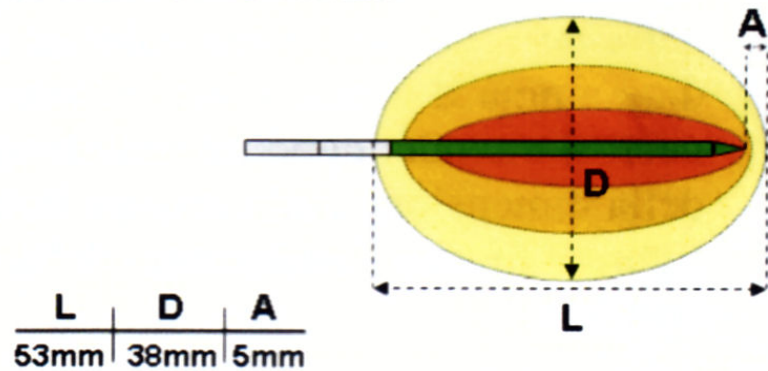
Major complications were observed in 8 patients (2.2%) and minor complications in 23 patients (6.3%). The 3-, and 5-year overall survival rates were 80% and 64%. One hundred and seven patients (29.5%) died, being 41 deaths (38.3%) Hepatocellular Carcinoma-related. At multivariate analysis only age ( $p = 0.04$ ; OR 2.29), ascites ( $p < 0.001$ ; OR 3.74) and Child-Pugh class  $\geq B8$  ( $p = 0.003$ ; OR 2.42) were confirmed as independent predictors for overall survival. The disease-free survival rates at 3- and 5-year were 50%, and 41.8%.

### **CONCLUSIONS:**

**Radiofrequency Ablation is an effective and safe tool for the treatment of single Hepatocellular Carcinoma ≤3 cm providing excellent 5-year overall survival and disease-free survival rates. Patient's age and liver status appeared as main determinants of outcome.**

# microwaves

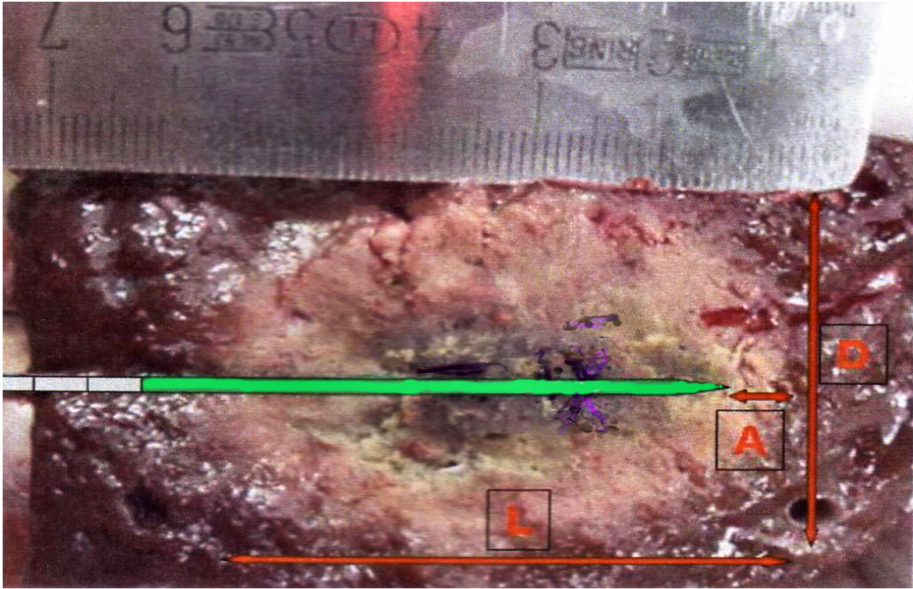
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L 12-17-22 cm

radiating portion of tip 3,7 cm

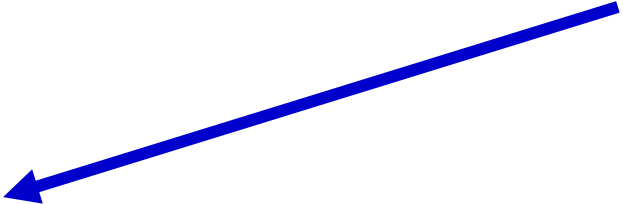
# microwaves



electromagnetic waves

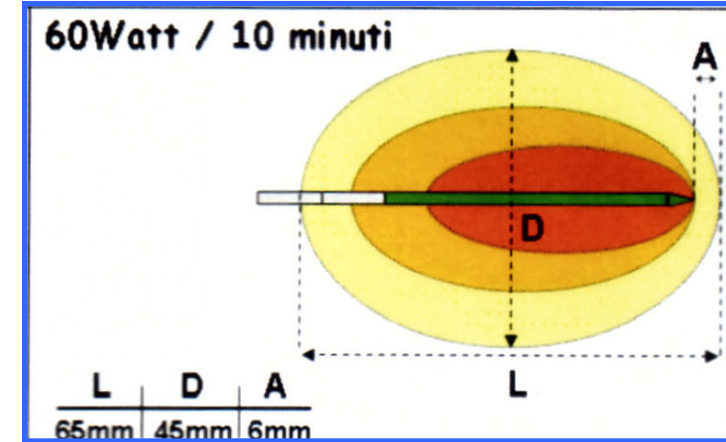
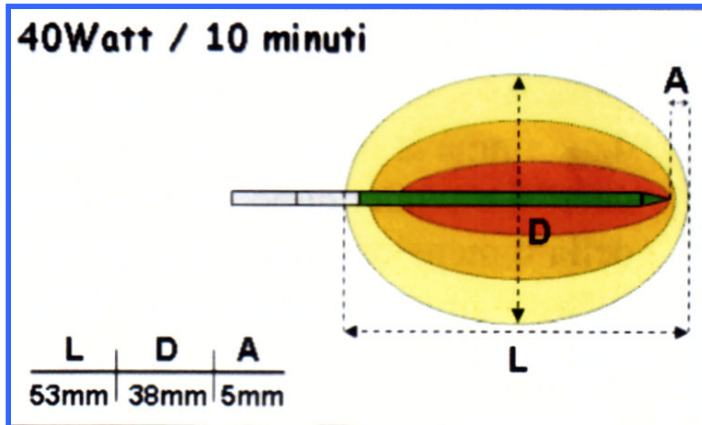
rotate H<sub>2</sub>O

heat



coagulative necrosis independent by impedance

# necrosis volume



Dimensioni Lesione (LxDxA, in mm)		Tempi		
		3min	5min	10min
<i>Potenze</i>	20W	30x19x3	34x22x3	35x28x4
	40W	36x24x4	42x30x4	53x38x5
	60W	45x26x4	47x36x4	65x45x6

- [Clin Radiol.](#) 2015 Jul 25.
- **High-powered microwave ablation of larger hepatocellular carcinoma: evaluation of recurrence rate and factors related to recurrence.**
- [Zhang NN](#)<sup>1</sup>, [Lu W](#)<sup>2</sup>, [Cheng XJ](#)<sup>1</sup>, [Liu JY](#)<sup>1</sup>, [Zhou YH](#)<sup>1</sup>, [Li F](#)<sup>1</sup>.

**To evaluate the safety and efficacy of high-powered (80-100 W) percutaneous microwave ablation (MWA) at a frequency of  $2450\pm 10$  MHz for treating larger hepatocellular carcinoma (HCC) and to predict the risk factors of local recurrence after high-powered MWA.**

Forty-five patients with a total of 60 lesions received high-power (80-100 W) MWA at a frequency of  $2450\pm 10$  MHz through a percutaneous approach that was guided by ultrasound. Of the 60 lesions with a maximum tumour measuring 3-8 cm, 46 lesions were 3-5 cm and 14 were 5-8 cm. The complete ablation rates, local recurrence rates, complications, and short-term survival were analysed. Ten possible risk factors for local recurrence were analysed.

Zhang NN

2015



- **The complete ablation rates were 82.61% for the first ablation and 100% for the second ablation for 3-5 cm lesions.**
- *The complete ablation rates were 64.29% (82.61% versus 64.29%,  $p=0.037$ ) for the first ablation and 85.71% (100% versus 85.71%,  $p=0.055$ ) for the second ablation for 5-8 cm lesions.*
- **Local recurrence was observed in 11 out of the 45 (24.44%) successfully treated patients. The 1-year and 2-year survival rates were 95.56% (43/45) and 86.67% (39/45), respectively.**
- **No procedure-related mortality was observed and no major bleeding, liver rupture, or liver abscesses occurred.**
- **2015 [Zhang NN](#)**

J Dig Dis. 2015 May 8.

# **Value of Microwave Ablation in Treatment of large lesions of Hepatocellular Carcinoma.**

Medhat E<sup>1</sup>, Abdel Aziz A<sup>1</sup>, Nabeel M<sup>1</sup>, Elbaz T<sup>1</sup>, Zakaria Z<sup>1</sup>, Shousha H<sup>1</sup>, Amer A<sup>1</sup>, Fouad Fathalah W<sup>1</sup>, Maher R<sup>2</sup>, Musa S<sup>1</sup>.

**Twenty six patients with HCC lesions (5-7cm)**

Complete ablation was achieved in (19/ 26; 73.1%) of the lesions. Local tumor progression was recorded in 5 treated lesions (19.2%).

- ***Microwave ablation by percutaneous approach is safe and effective in the treatment of large HCC tumor. The survival and local tumor control were acceptable.***

- [Ultrasound Med Biol.](#) 2015 Sep;41(9):2400-11.
- **Radiofrequency Ablation for Hepatocellular Carcinoma: Utility of Conventional Ultrasound and Contrast-Enhanced Ultrasound in Guiding and Assessing Early Therapeutic Response and Short-Term Follow-Up Results.**
- [Du J](#)<sup>1</sup>, [Li HL](#)<sup>1</sup>, [Zhai B](#)<sup>2</sup>, [Chang S](#)<sup>3</sup>, [Li FH](#)<sup>4</sup>.

**the combined use of conventional US and CEUS provides a safe and efficient tool to guide RF ablation for HCCs 3 cm or smaller, with encouraging results in terms of survival rate and minimal complications.**

- *Moreover, the immediate post-procedural CEUS can be a reliable alternative to contrast-enhanced MRI for assessing the early therapeutic response to RF ablation.*

Ultrasound Med Biol. 2015 Du J<sup>1</sup>, Li HL<sup>1</sup>, Zhai B<sup>2</sup>, Chang S<sup>3</sup>, Li FH<sup>4</sup>

- [J Gastroenterol Hepatol](#). 2015 Jun 25.
- **Percutaneous thermal ablation for primary hepatocellular carcinoma: A systematic review and meta-analysis.**
- [Chinnaratha MA](#)<sup>1,2</sup>, [Chuang MA](#)<sup>2</sup>, [Fraser RJ](#)<sup>1,2</sup>, [Woodman RJ](#)<sup>1</sup>, [Wigg AJ](#)<sup>1,2</sup>.

- *Ten studies (2 prospective and 8 retrospective) were included and the overall LTP rate was 13.6% (176/1298). There was no difference in LTP rates between RFA and MWA [OR (95%CI): 1.01(0.67-1.50), p=0.9]. The CA rate, 1- and 3- year overall survival and major AE were similar between the two modalities*
- **Overall, both RFA and MWA are equally effective and safe but MWA may be more effective compared to RFA in preventing LTP when treating larger tumours. Well-designed, larger, multicentre RCTs are required to confirm these findings.**
- [J Gastroenterol Hepatol.](#) 2015 Jun 25

Radiology. August 2015; 276(2): 315–317.

**Science to Practice: The Changing Face of Local Tumor Therapies—Do We Have to Think Systemically When Treating Cancer Locally?**

[Julius Chapiro](#)



[Radiology](#). 2015 Aug;276(2):426-32.

# **Oncogenesis: An "Off-Target" Effect of Radiofrequency Ablation.**

[Rozenblum N<sup>1</sup>](#), [Zeira E<sup>1</sup>](#), [Scaiewicz V<sup>1</sup>](#), [Bulvik B<sup>1</sup>](#), [Gourevitch S<sup>1</sup>](#), [Yotvat H<sup>1</sup>](#), [Galun E<sup>1</sup>](#), [Goldberg SN<sup>1</sup>](#).

- To compare hepatocellular carcinoma (HCC) development after radiofrequency (RF) ablation, partial surgical hepatectomy, and a sham operation and to inhibit HCC recurrence after RF ablation in a mouse model of spontaneously forming HCC in the setting of chronic inflammation (ie, the MDR2 knockout model)..
- **Ablation of  $3.5\% \pm 0.02$  of the MDR2 knockout mice liver induced increased tumor load ( $P = .007$ ) and reduced survival ( $P = .03$ ) in comparison to that of controls.**
- A significant elevation of hepatocyte proliferation was also seen 7 days after RF ablation in the distant liver (ablated lobe:  $P = .003$ ; untreated lobe:  $P = .02$ ).
- *A c-met inhibitor significantly attenuated HCC development in MDR2 knockout mice treated with RF ablation ( $P = .001$ ).*
- *Conclusion*
- *Liver regeneration induced by RF ablation facilitates c-met/hepatocyte growth factor axis-dependent HCC tumor formation after treatment in the MDR2 knockout model.*
- *Blockage of the c-met/hepatocyte growth factor axis attenuates HCC recurrence, raising the potential for therapeutic intervention to reverse this potentially deleterious tumorigenic effect.*

- [Jpn J Radiol.](#) 2015 Jul;33(7):424-32

## **Irreversible electroporation for nonthermal tumor ablation in patients with hepatocellular carcinoma: initial clinical experience in Japan.**

- [Sugimoto K<sup>1</sup>](#), [Moriyasu F](#), [Kobayashi Y](#), [Saito K](#), [Takeuchi H](#), [Ogawa S](#), [Ando M](#), [Sano T](#), [Mori T](#), [Furuichi Y](#), [Nakamura I](#).

- Five patients (3 men and 2 women; mean age,  $66.6 \pm 5.8$  years) with 6
- *The tumors ranged in diameter from 11 to 28 mm (mean diameter,  $17.5 \pm 6.3$  mm). Five of the 6 tumors (83 %) were successfully treated, with no local recurrence to date (mean follow-up  $244 \pm 55$  days). In 1 lesion located in liver segment 1, residual tumor was diagnosed at 7 days after intervention by follow-up EOB-MRI. No serious complications related to the IRE procedure were observed.*
- CONCLUSION:
- **The results of this study suggest that image-guided percutaneous IRE can achieve satisfactory local disease control, particularly for small HCCs, and is well tolerated by patients**
- [Jpn J Radiol.](#) 2015 July

# IRE OF UNRESECTABLE, UNABLATABLE HILAR HCC, WITHOUT CIRRHOSIS



Conventional US

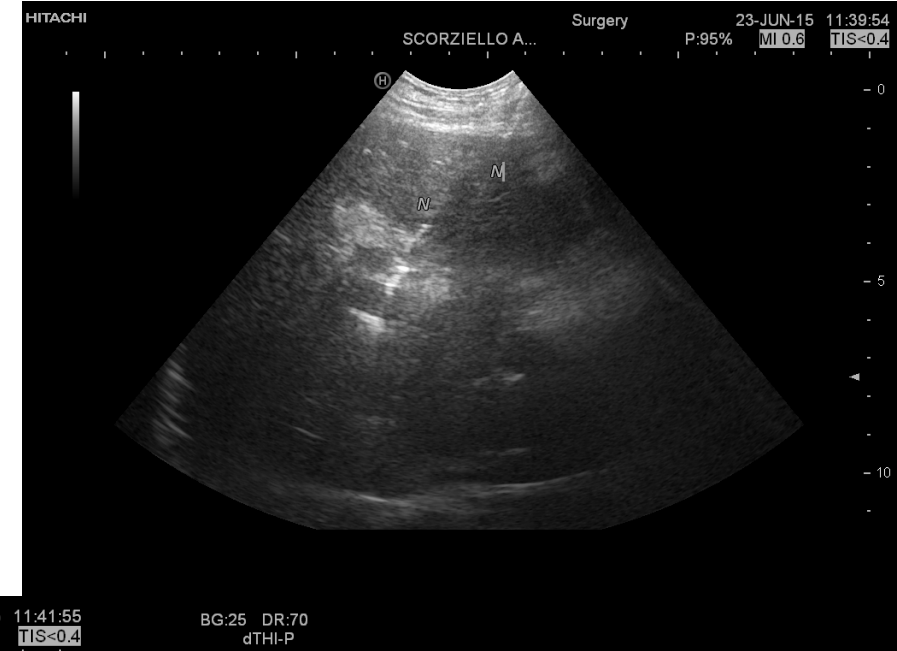


CEUS



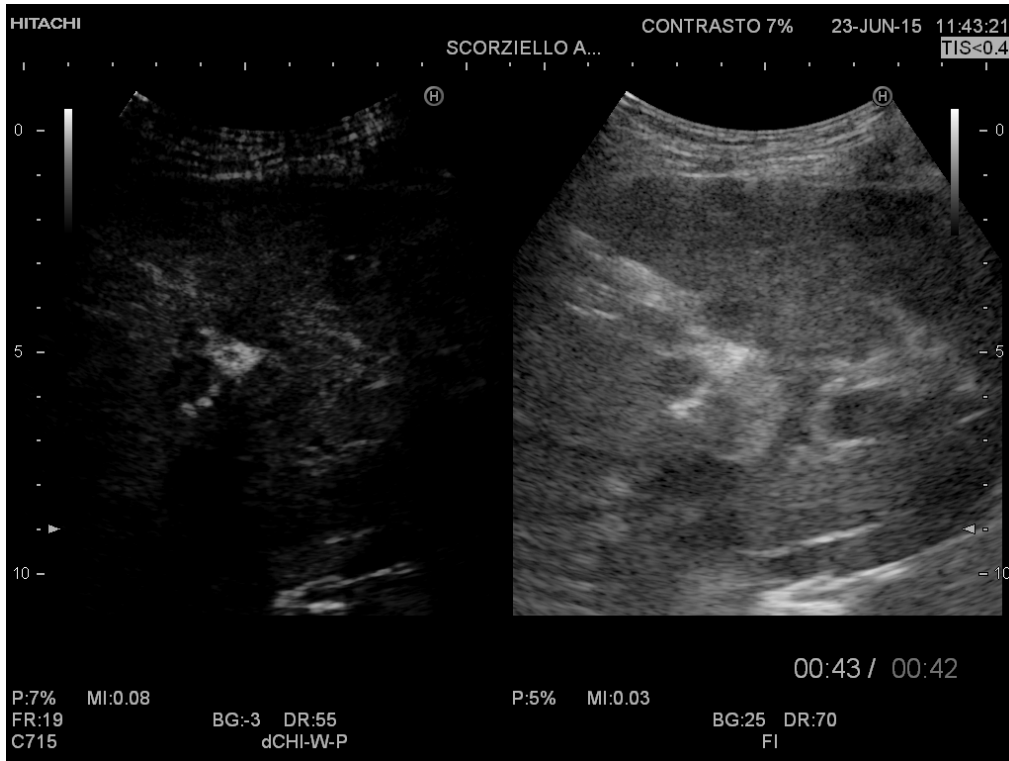
# IRE OF UNRESECTABLE, UNABLATABLE HILAR HCC, WITHOUT CIRRHOSIS

## PROCEDURE



# IRE OF UNRESECTABLE, UNABLATABLE HILAR HCC, WITHOUT CIRRHOSIS

## AFTER IRE CEUS SHOWS AVASCULAR HCC



- [J Vasc Interv Radiol](#). 2015 May;26(5):694-702. doi: 10.1016/j.jvir.2015.02.001. Epub 2015 Mar 23.
- **Factors associated with short-term local recurrence of liver cancer after percutaneous ablation using irreversible electroporation: a prospective single-center study.**
- [Niessen C](#)<sup>1</sup>, [Igl J](#)<sup>2</sup>, [Pregler B](#)<sup>2</sup>, [Beyer L](#)<sup>2</sup>, [Noeva E](#)<sup>3</sup>, [Dollinger M](#)<sup>2</sup>, [Schreyer AG](#)<sup>2</sup>, [Jung EM](#)<sup>2</sup>, [Stroszczyński C](#)<sup>2</sup>, [Wiggermann P](#)<sup>2</sup>.



- **Thirty-nine consecutive patients (79 malignant liver lesions) were treated with IRE,**
- 25 patients (aged  $59.4 \text{ y} \pm 11.2$ ) had 48 malignant liver lesions, including 22 hepatocellular carcinomas (HCCs), six cholangiocellular carcinomas, and 20 metastatic liver cancers. Fourteen of the 48 treated lesions (29.2%) showed early local recurrence after 6 months. Tumor volume ( $< 5 \text{ cm}^3$  vs  $\geq 5 \text{ cm}^3$ ;  $P = .022$ ) and underlying disease type (HCC, cholangiocellular carcinoma, or metastatic disease;  $P = .023$ ) were independently associated with early local recurrence. However, distances to the surrounding portal veins ( $< 0.5 \text{ cm}$  vs  $\geq 0.5 \text{ cm}$ ;  $P = .810$ ), hepatic veins ( $P = .170$ ), hepatic arteries ( $P = .761$ ), and bile ducts ( $P = .226$ ) were not significantly associated with local recurrence.
- **CONCLUSIONS:**
- **Because short distances to the surrounding vessels were not associated with early local recurrence, percutaneous IRE might provide an alternative treatment option for perivascular tumors.**
- However, patients with larger tumor volumes appeared to be poor candidates for percutaneous IRE. Regarding the different types of treated lesions, patients with HCC had significantly better outcomes. [J Vasc Interv Radiol.](#) 2015 May

- [Eur Radiol.](#) 2015 May 22. [Epub ahead of print]
- **Thermal ablation of colorectal liver metastases: a position paper by an international panel of ablation experts, the interventional oncology sans frontières meeting 2013.**
- [Gillams A](#)<sup>1</sup>, [Goldberg N](#)<sup>2</sup>, [Ahmed M](#)<sup>2</sup>, [Bale R](#)<sup>3</sup>, [Breen D](#)<sup>4</sup>, [Callstrom M](#)<sup>5</sup>, [Chen MH](#)<sup>6</sup>, [Choi BI](#)<sup>7</sup>, [de Baere T](#)<sup>8</sup>, [Dupuy D](#)<sup>9</sup>, [Gangi A](#)<sup>10</sup>, [Gervais D](#)<sup>11</sup>, [Helmberger T](#)<sup>12</sup>, [Jung EM](#)<sup>13</sup>, [Lee F](#)<sup>14</sup>, [Lencioni R](#)<sup>15</sup>, [Liang P](#)<sup>16</sup>, [Livraghi T](#)<sup>17</sup>, [Lu D](#)<sup>18</sup>, [Meloni F](#)<sup>19</sup>, [Pereira P](#)<sup>20</sup>, [Piscaglia F](#)<sup>21</sup>, [Rhim H](#)<sup>22</sup>, [Salem R](#)<sup>23</sup>, [Sofocleous C](#)<sup>24</sup>, [Solomon SB](#)<sup>24</sup>, [Soulen M](#)<sup>25</sup>, [Tanaka M](#)<sup>26</sup>, [Vogl T](#)<sup>27</sup>, [Wood B](#)<sup>28</sup>, [Solbiati L](#)<sup>29</sup>.

- **Tumor volume**

The consensus was that smaller < 3cm tumors are more straightforward treated than large tumors but that well located tumours <5 cm can be effectively treated depending on their anatomical position

- Consensus level: strong

- **Tumor number**
- The consensus was that patients with **five or fewer tumours** should routinely be considered for ablation and that patients with nine or fewer tumours should be considered in selected cases.

***Consensus level: strong.***

- **Overall liver tumour volume**

**. We would therefore recommend that in addition to size and tumour volume**

**the total liver tumour volume is taken into consideration.**

Consensus level: strong

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[Eur Radiol.](#) 2015 May 22

- **Current clinical Indications for thermal ablation**
- Patients with **non-resectable disease due to number and distribution of metastases should receive ablation± chemotherapy instead of systemic chemotherapy alone**
- Patients with ***non-resectable disease due to inadequate liver reserve either because of prior resection or widely scattered tumours***

- [Hepatogastroenterology](#). 2015 Mar-Apr;62(138):373-7.
- **The effect of radiofrequency ablation vs. liver resection on survival outcome of colorectal liver metastases (CRLM): a meta-analysis.**
- [Bai H](#), [Huangz X](#), [Jing L](#), [Zeng Q](#), [Han L](#).

- For patients with solitary colorectal liver metastasis (CRLM), it is still controversial whether radiofrequency ablation (RFA) has the same effect as liver resection (LR). This study aims to pool available evidence and to analyze the effect of RFA versus LR for resectable solitary CRLM in survival indicators.
- **METHODOLOGY:**
- Relevant studies were searched among databases and a meta-analysis was performed to pool the hazard ratio (HR) of RFA versus LR in overall survival (OS) and disease free survival (DFS).
- **RESULTS:**
- A total of 10 studies were included in this meta-analysis. Pooled results showed poorer OS (HR: 1.85, 95% CI: 1.48 to 2.32,  $p < 0.00001$ ) and DFS (HR: 1.68, 95% CI: 1.14 to 2.48,  $p = 0.009$ ) among the patient received RFA compared those received LR. Sensitivity analysis confirmed high robustness of the findings.
- **CONCLUSION:**
- In patients with resectable CRLM, LR is superior to RFA in survival outcomes. RFA should be reserved for patients who are not optimal candidates for resection until new supportive evidence is obtained from large RCTs.



- [Anticancer Res.](#) 2011 Dec;31(12):4575-80.

**Radiofrequency ablation for intrahepatic cholangiocarcinoma: retrospective analysis of a single centre experience.**

- [Giorgio A](#), [Calisti G](#) et al

To evaluate the usefulness and safety of radiofrequency ablation for primary and recurrent intrahepatic cholangiocarcinoma (ICC) in our single centre experience.

#### **MATERIALS AND METHODS:**

Ten patients with ICC refusing or not eligible for surgery underwent radiofrequency ablation for their tumor. The ICC was primary in 9 cases and recurrent, after 2 previous resections, in 1 patient. Radiofrequency ablation was performed percutaneously under ultrasound guidance using a 15G perfused electrode. Technical success of the procedure was assessed by contrast-enhanced ultrasound (CEUS). Technical effectiveness was evaluated by CEUS and contrast enhanced CT 1 month after the last course of a defined ablation protocol. Follow-up contrast enhanced CT or MRI were performed every 3-6 months.

#### **RESULTS:**

RFA was always technically successful and effective for ICC lesions  $\leq 3.4$  cm and ineffective for lesion  $\geq 4$  cm. After a median follow-up of 19.5 months (range 9-64 months), 8 patients were still alive while 2 had died due to tumor progression. The 1-, 3- and 5-year overall survival rate of all patients with ICC of our series were 100%, 83.3% and 83.3%. No major complication was observed.

#### **CONCLUSION:**

- **Radiofrequency ablation seems to be a safe and effective option for small ( $\leq 3.4$  cm) ICC nodules. In addition it may be considered as a palliative treatment for larger tumors.**
- [Giorgio A, Calisti G et al, 2011](#)

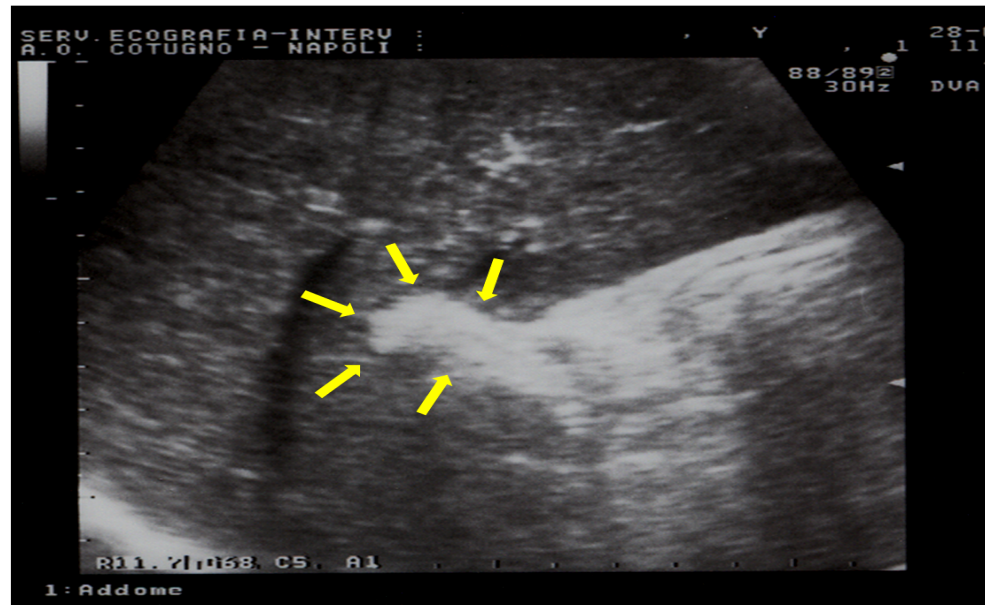
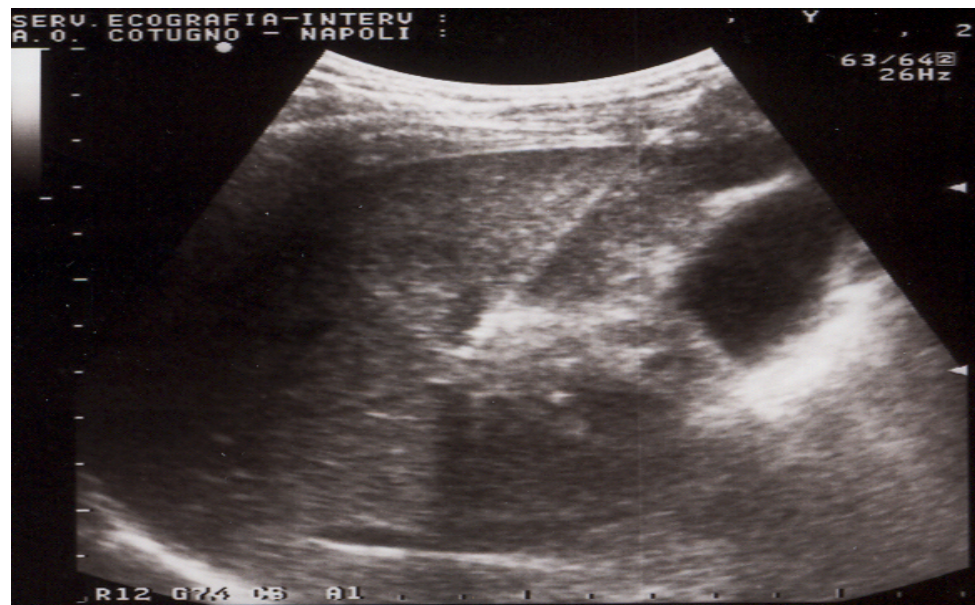
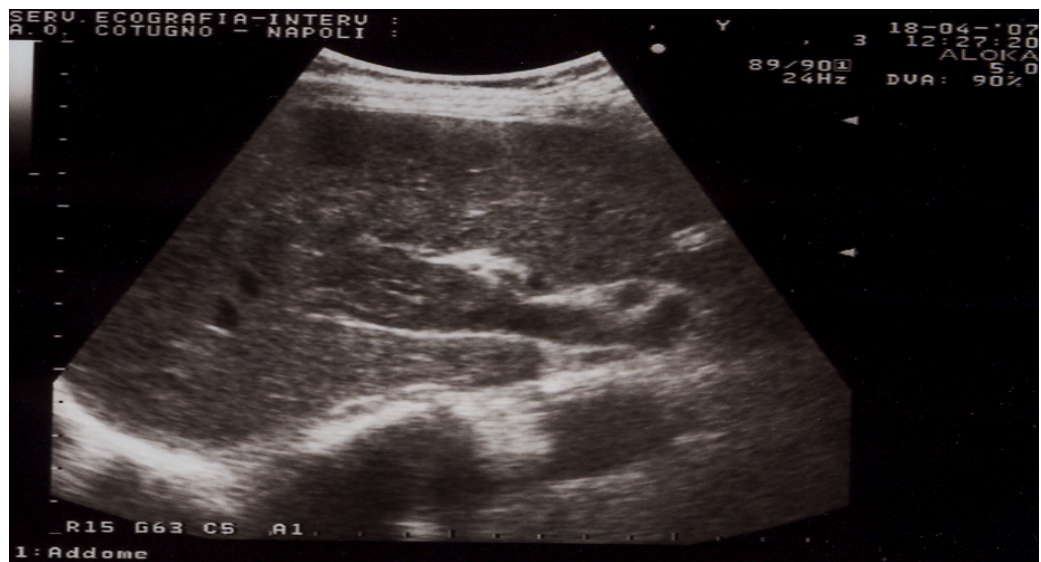


# Advanced HCC

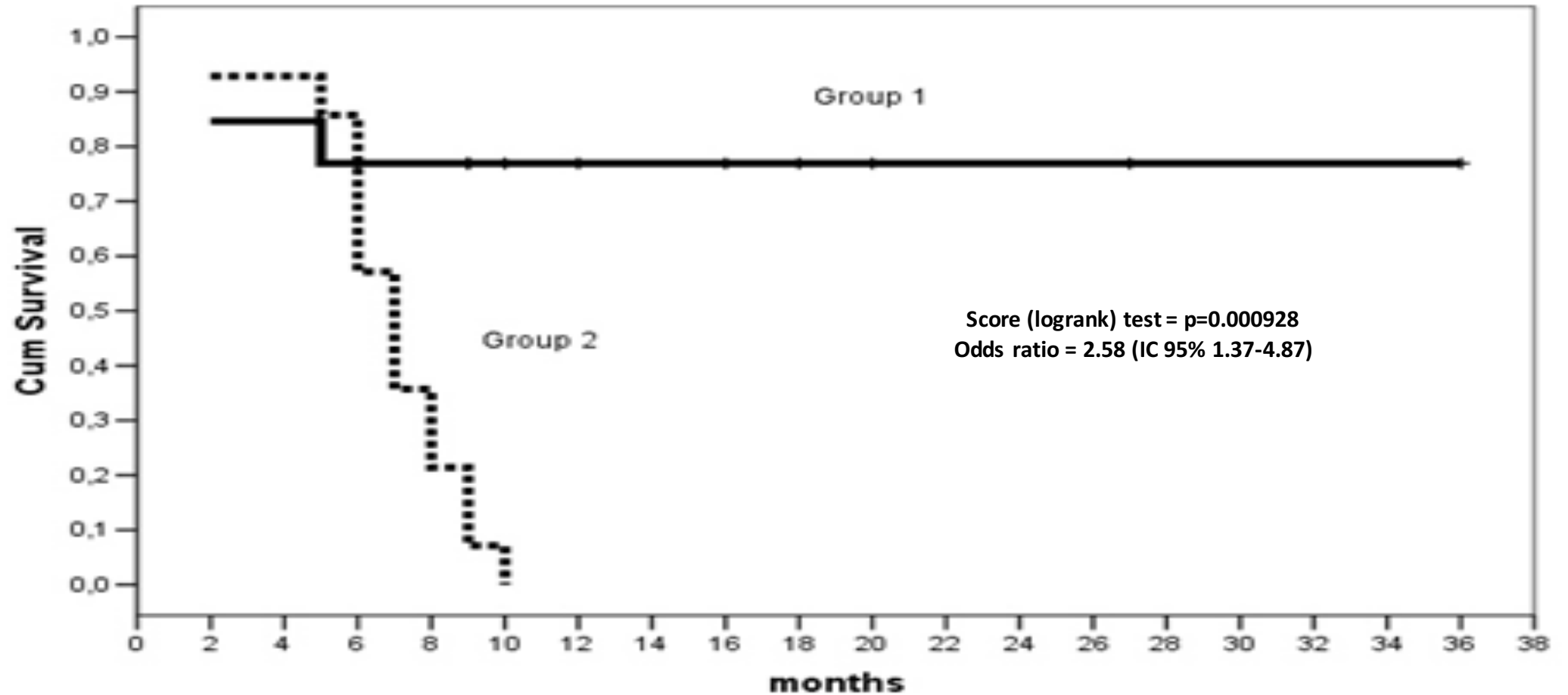
**What possibilities for interventional ultrasound?**

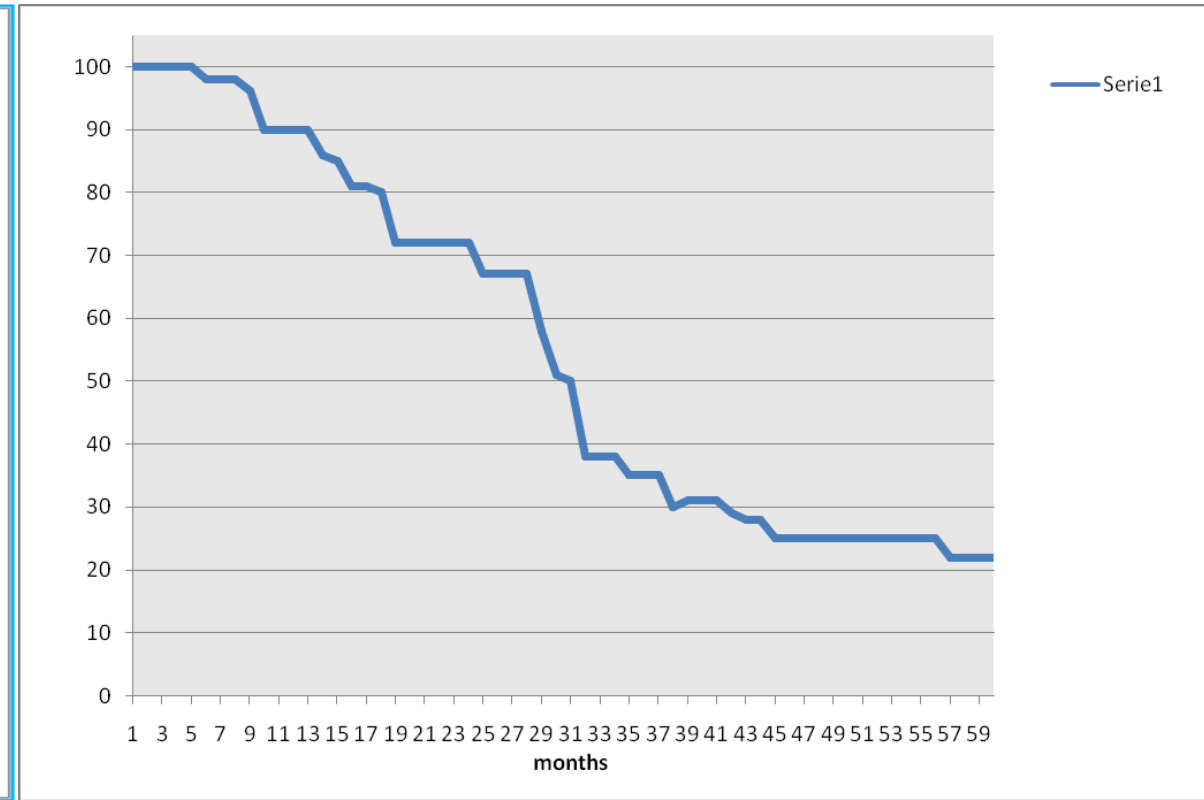
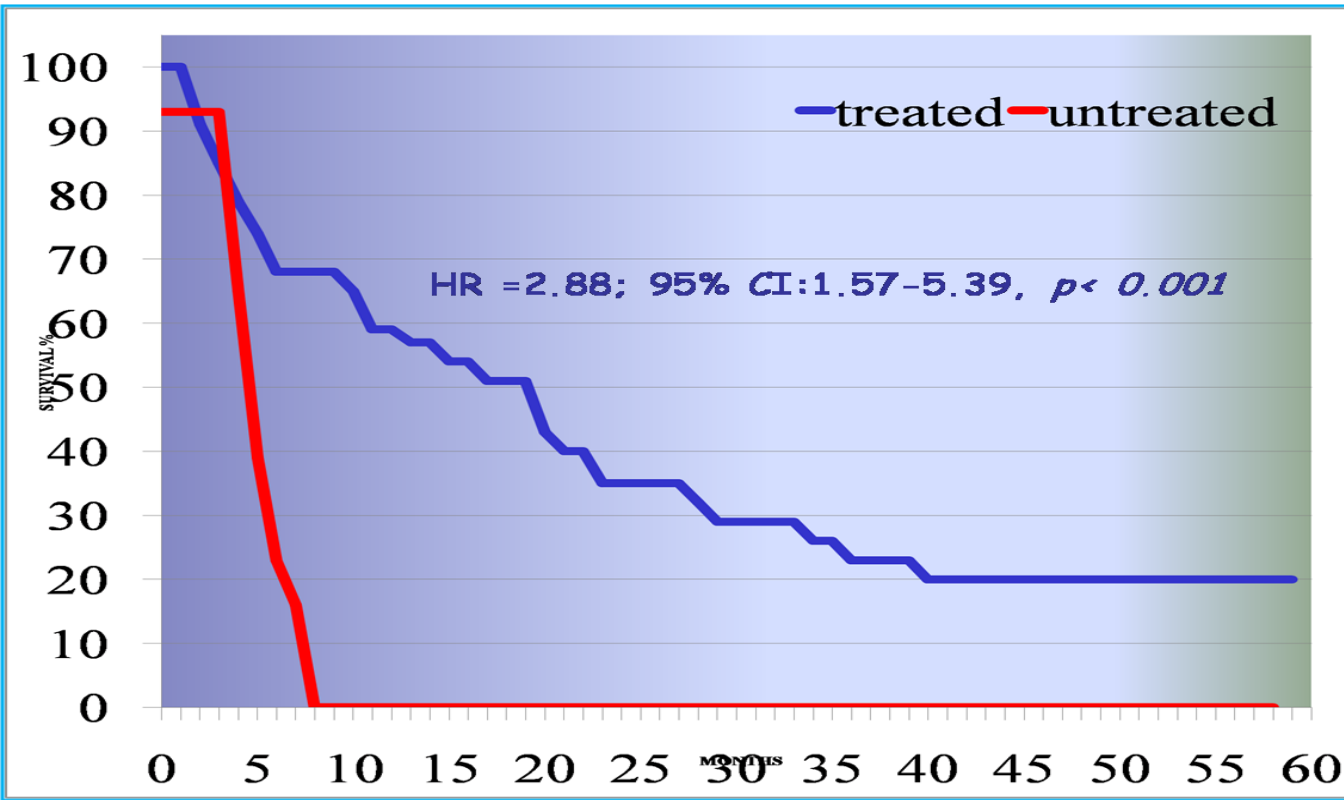
**Hepatocellular Carcinoma on cirrhosis: are patients with neoplastic main portal vein invasion eligible for percutaneous Radiofrequency ablation of both nodule and portal vein tumor thrombus?**

**A. Giorgio et al, AJR October 2009**



# results





Giorgio A. et al ; Anti Cancer Research 2014, october



## **Hepatocellular carcinoma ( HCC ) invading portal venous system in cirrhosis: 7 years results of Percutaneous Radiofrequency Ablation of both HCC nodule and main portal vein tumor thrombus (MPVTT )**

The 1, 3, 5 and 7- year cumulative survival rates of treated patients were 62 , 29 , 18 and 5 % , respectively. The 12-months cumulative survival rate of untreated patients was 0%. The difference was statistically significant ( $p < 0.001$ ; hazard ratio, 2.88; 95% CI, 1.57– 5.39).

### **CONCLUSIONS:**

**RFA of HCC with MPVTT significantly prolongs long-term survival compared with no treatment.**

***The procedure is safe and should be considered as a new and effective tool in the treatment of advanced HCC***