VI CONGRESO ALATRO
Asociación Ibero Latinoamericana de Terapia Radiante Oncológica

# Radioterapia Estereotáxica Corporal (SBRT) en Hígado (con foco en Carcinoma Hepatocelular)

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Oncólogo Radioterapeuta
Fundación Arturo López Perez

FALP
Juntos contra el cáncer

# Declaración de Conflictos

- Director Médico del sitio www.estudiosclinicos.org
  - Se financia (se financiará....) con aportes de la industria farmacéutica

- Consultor en Economía de la Salud en Bitrán y Asociados y en Health Analytics Group
  - Múltiples estudios para ISAPRES, Clínicas, Laboratorios, ONGs y Estado

# SBRT

- Radioterapia externa que entrega una alta dosis de radiación a un blanco extracraneal en pocas fracciones (típicamente 1 a 6)
- Planificación especializada resulta en una alta dosis al blanco con dosis bajas a tejidos circundantes
- Requiere equipos más sofisticados que la radioterapia 3D convencional, con el fin de localizar el blanco y mejorar la precisión en la entrega de la dosis
- Maniobras para limitar o compensar el movimiento del blanco o los órganos en riesgo son componentes vitales de esta técnica
  - Evaluación del movimiento durante la simulación
  - Maniobras enfocadas en el paciente (compresión abdominal, control respiratorio)
  - Maniobras enfocadas en el equipo (gating, tracking del blanco)

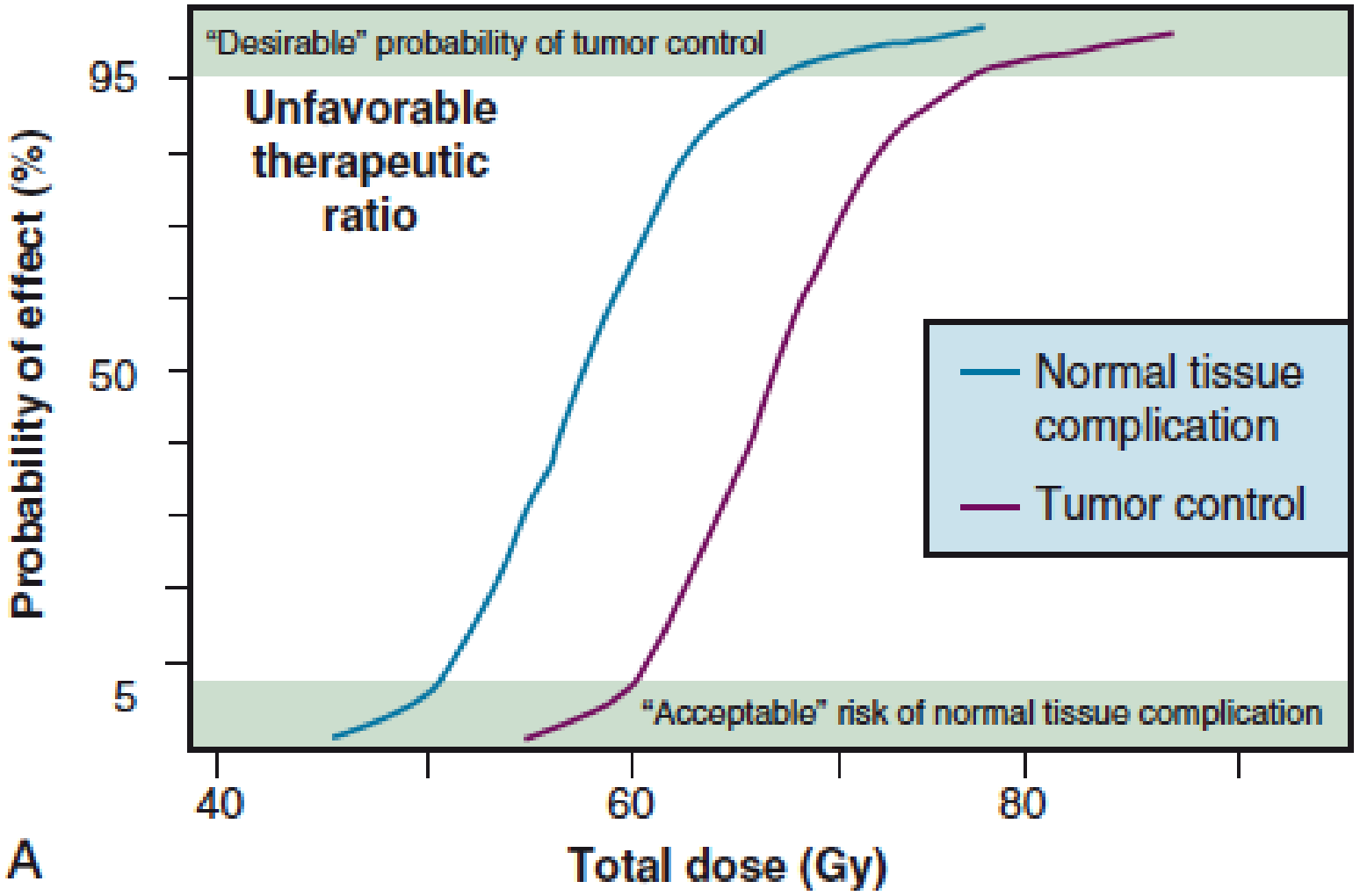
ACR–ASTRO PRACTICE PARAMETER FOR THE PERFORMANCE OF STEREOTACTIC BODY RADIATION THERAPY, 2014

# Dogma: No se puede irradiar el hígado

- Stanford (Ingold, 1965)
  - Retrospectivo
  - 40 pacientes
  - 44% RILD con dosis > 35 Gy

- RTOG 84-05 (Russell, 1991)
  - Fase I/II
  - Escalación de dosis
  - 10% RILD dosis > 33 Gy
  - Considerado no seguro

# La razón terapéutica....

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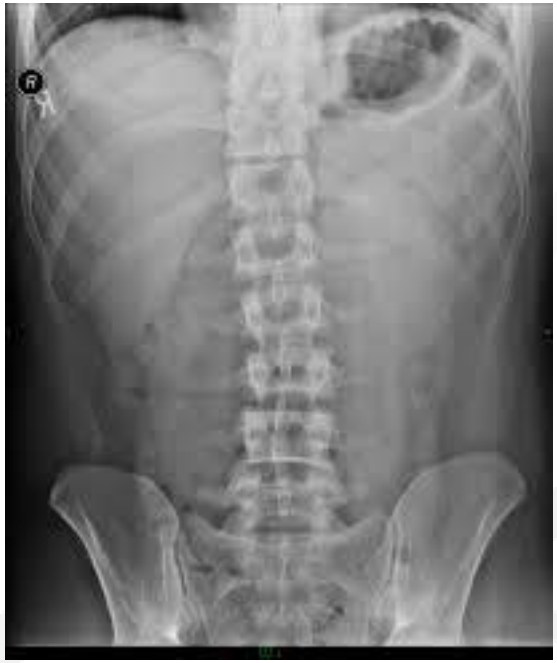
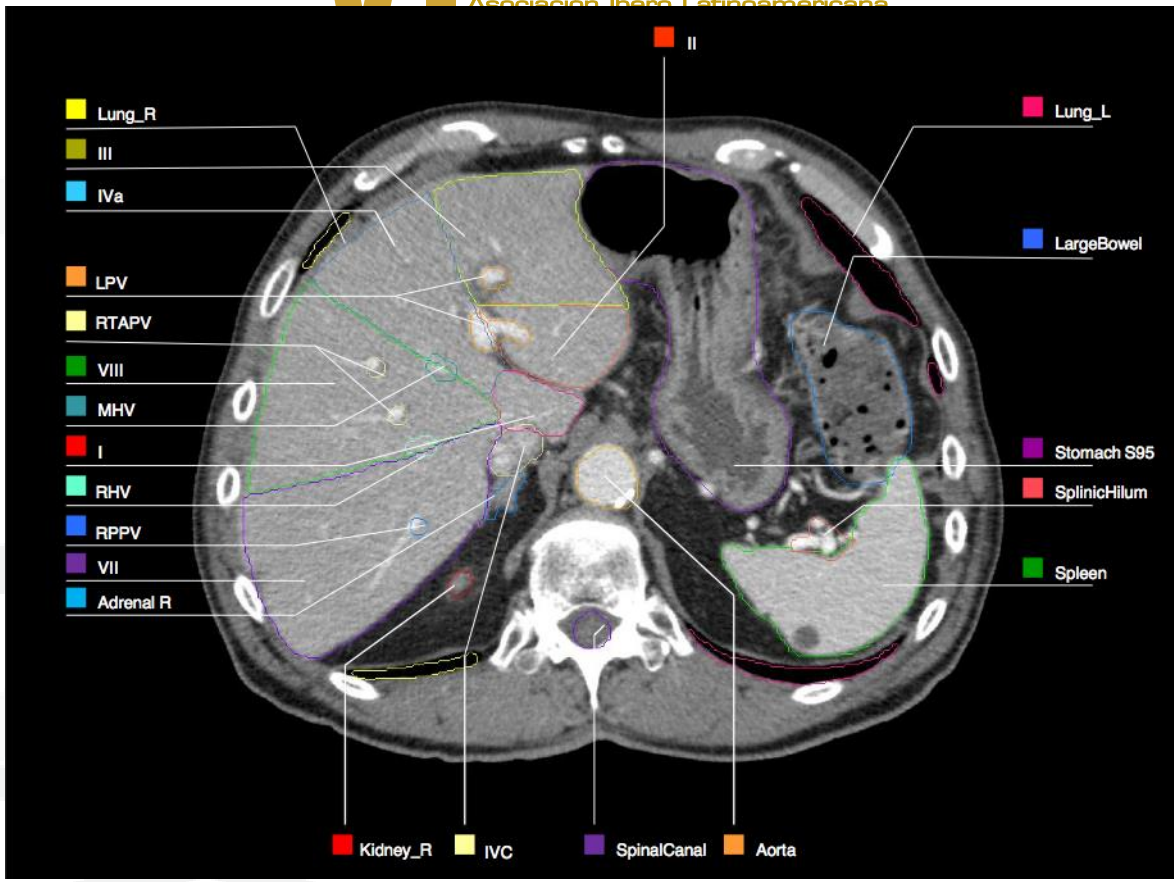
ALATRO

# ¿y qué pasó?




II
Lung_R
III
IVa
LPV
RTAPV
VIII
MHV
I
RHV
RPPV
VII
Adrenal R
Lung_L
LargeBowel
Stomach S95
SplinicHilum
Spleen
Kidney_R
IVC
SpinalCanal
Aorta

# Escalated Focal Liver Radiation and Concurrent Hepatic Artery Fluorodeoxyuridine for Unresectable Intrahepatic Malignancies

By Laura A. Dawson, Cornelius J. McGinn, Daniel Normolle, Randall K. Ten Haken, Suzette Walker, William Ensminger, and Theodore S. Lawrence

| Day # | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HA FUdR | X | X | X | X | X | X | X | X | X | X | X | X |
| RT 1.5 Gy | | X | X | X | X | X | | X | X | X | X | X |
| RT 1.5 Gy | | X[a] | X | X | X | | | X | X | X | X | X |

| Day # | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HA FUdR | X | X | X | X | X | X | X | X | X | X | X | X | | |
| RT 1.5 Gy | | X | X | X | X | X | | X | X | X | X | X | X | X |
| RT 1.5 Gy | | X | X | X | X | | | X | X | X | X | X | X | X |

*RT continued until total dose is delivered*

Fig 1. Treatment schema of phase I study of escalated focal liver RT in combination with continuous infusion hepatic arterial FUdR for the treatment of patients with intrahepatic malignancies. Abbreviation: HA, hepatic arterial. [a]Second dose of 1.5 Gy was delivered more than 6 hours after the first dose of 1.5 Gy.

- 27 pacientes con cáncer hepatobiliar
- 16 pacientes con metástasis hepáticas
- Mediana edad 56 años
- Mediana tamaño tumoral 10 cm (máximo 21 cm)
- Escalación de dosis individual con un riesgo de 10-15% de RILD

*Journal of Clinical Oncology*, Vol 18, No 11 (June), 2000: pp 2210-2218

# ¿Radioterapia Factible?

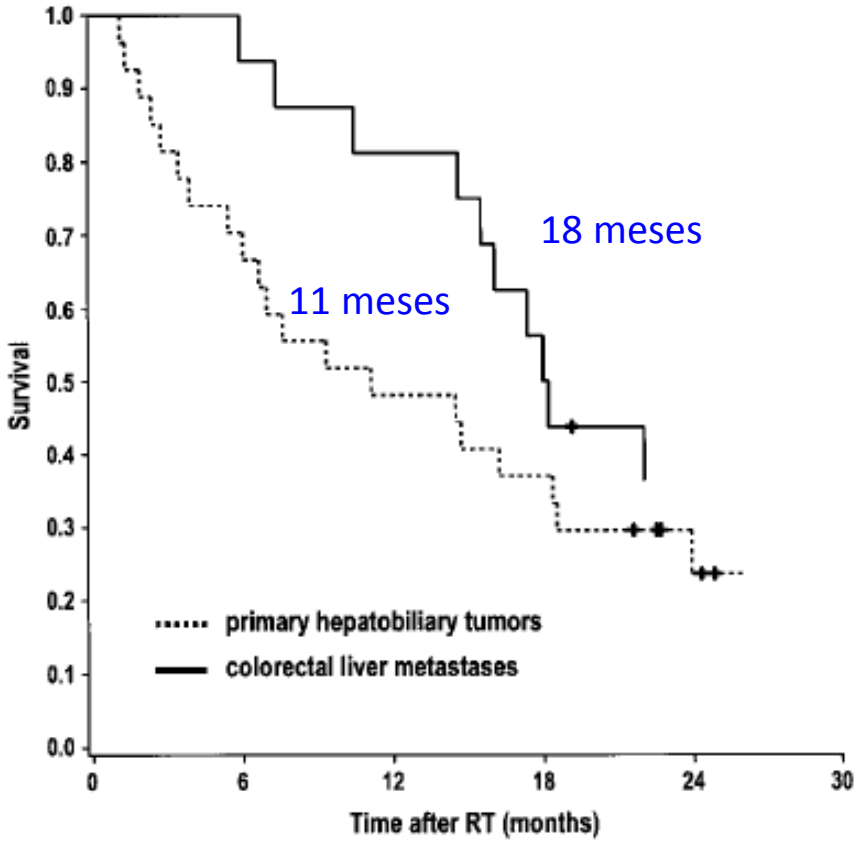



Fig 4. Actuarial survival of patients with intrahepatic colorectal carcinoma liver metastases and primary hepatobiliary cancer treated with escalated focal liver RT in combination with continuous infusion hepatic arterial FUdR, including patients who did not complete treatment.

**Table 4. Treatment Toxicities**

| Toxicity | No. of Patients |
|---|---|
| Acute toxicity | |
| Nausea and vomiting, febrile episodes | |
| Dissections of the hepatic artery | 2 |
| Hepatic artery thrombosis and stroke | 1 |
| Infection related to catheter placement | 2 |
| Esophagitis | 1 |
| Skin erythema | 1 |
| Late toxicity | |
| RILD | 1 |
| Upper gastrointestinal bleeding | 3 |
| Chronic gastritis | 1 |
| Biliary stricture | 2 |

# La importancia de la dosis

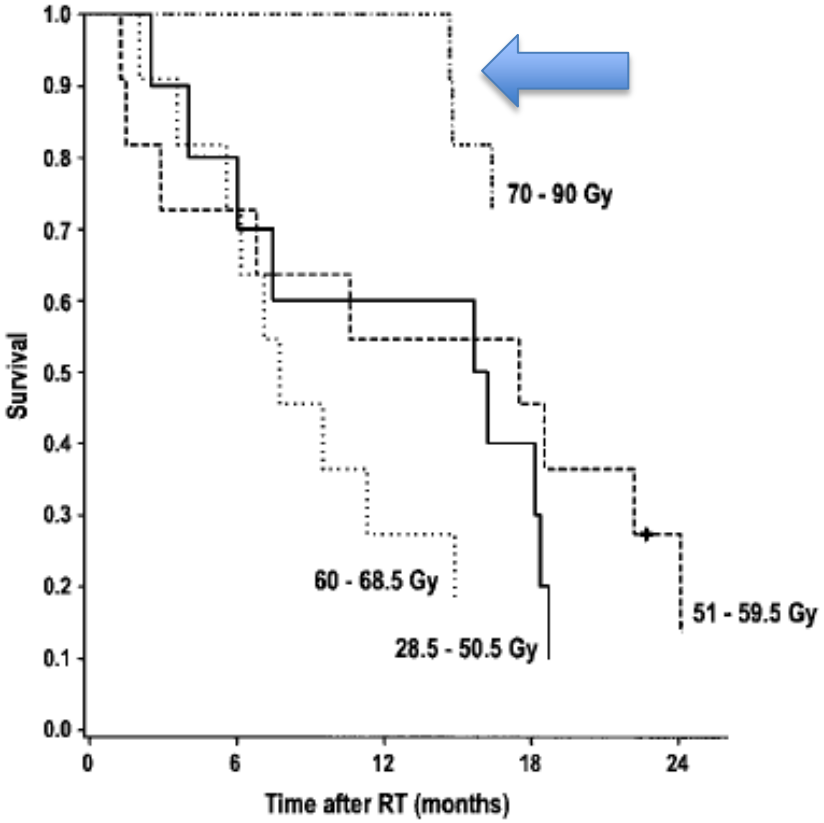



Fig 6. Actuarial survival of patients treated with escalated focal liver RT in combination with continuous infusion hepatic arterial FUdR based on RT dose received.

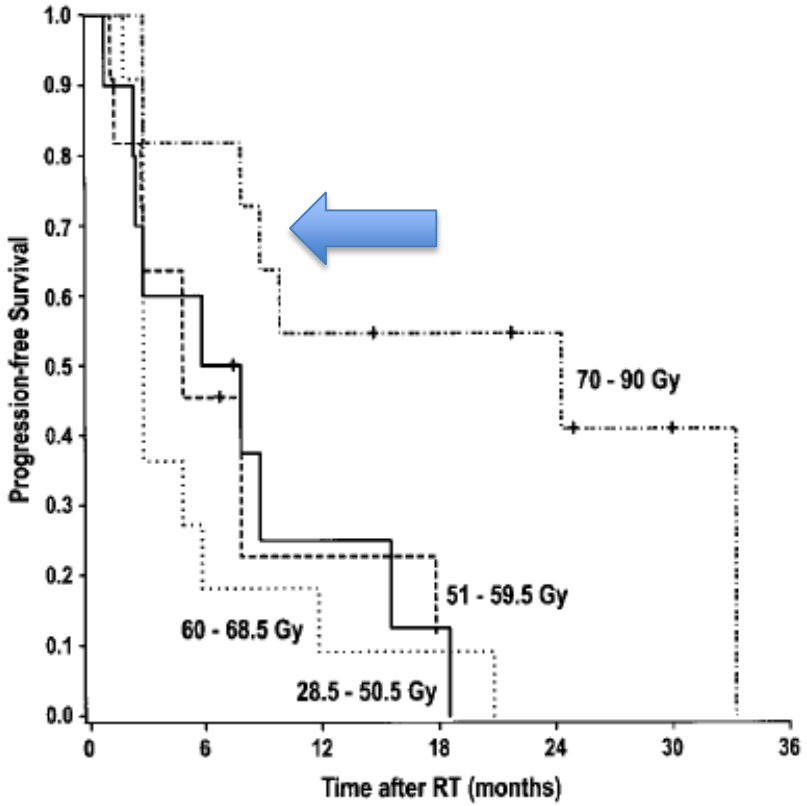



Fig 5. Actuarial progression-free survival of patients treated with escalated focal liver RT in combination with continuous infusion hepatic arterial FUdR based on RT dose received.

VOLUME 23 · NUMBER 34 · DECEMBER 1 2005

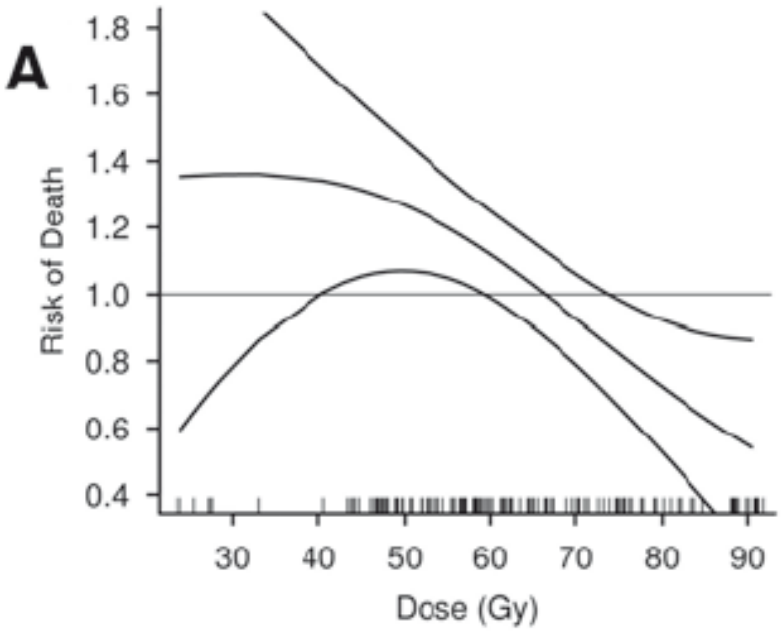
JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

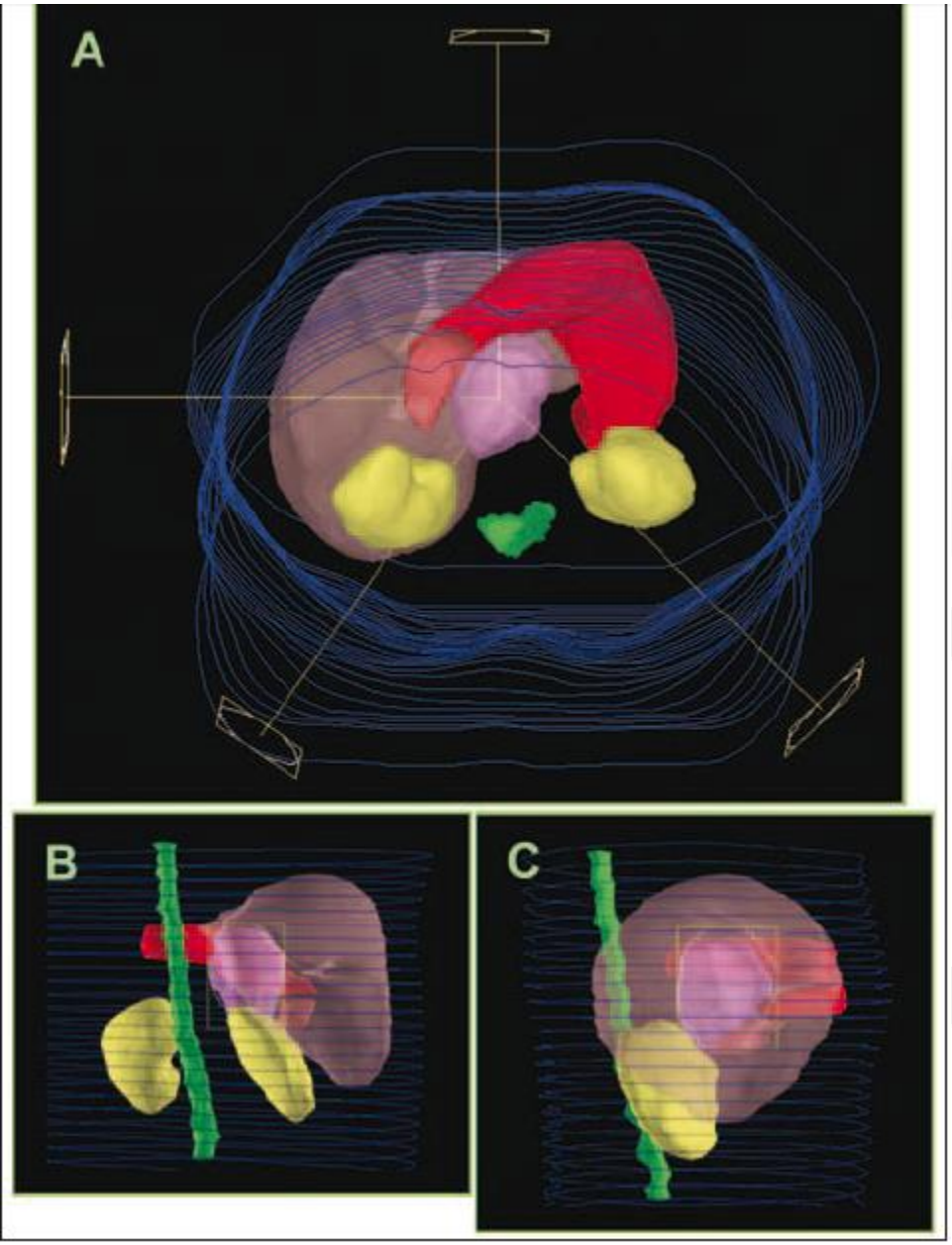
# Phase II Trial of High-Dose Conformal Radiation Therapy With Concurrent Hepatic Artery Floxuridine for Unresectable Intrahepatic Malignancies

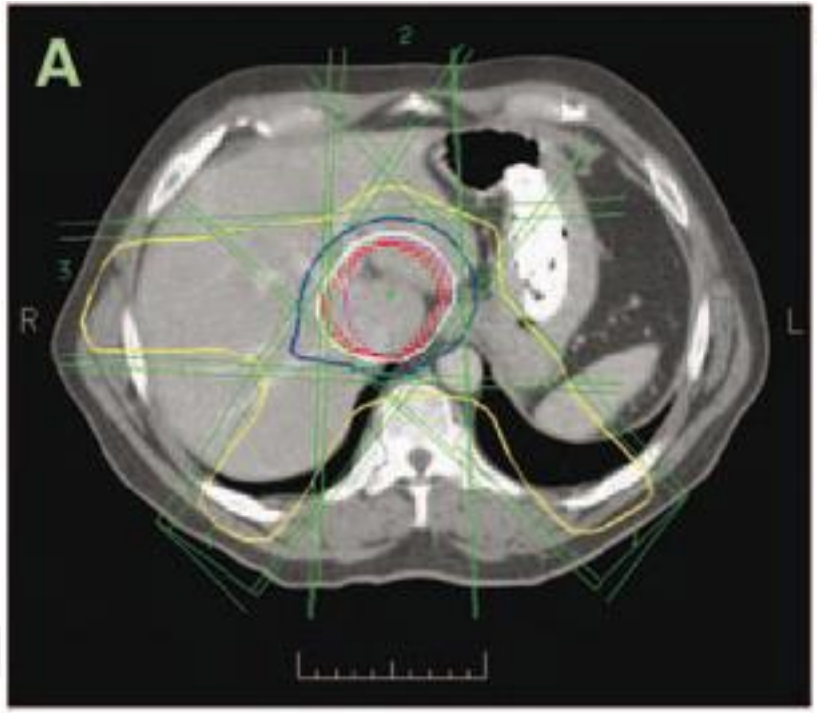
*Edgar Ben-Josef, Daniel Normolle, William D. Ensminger, Suzette Walker, Daniel Tatro, Randall K. Ten Haken, James Knol, Laura A. Dawson, Charlie Pan, and Theodore S. Lawrence*

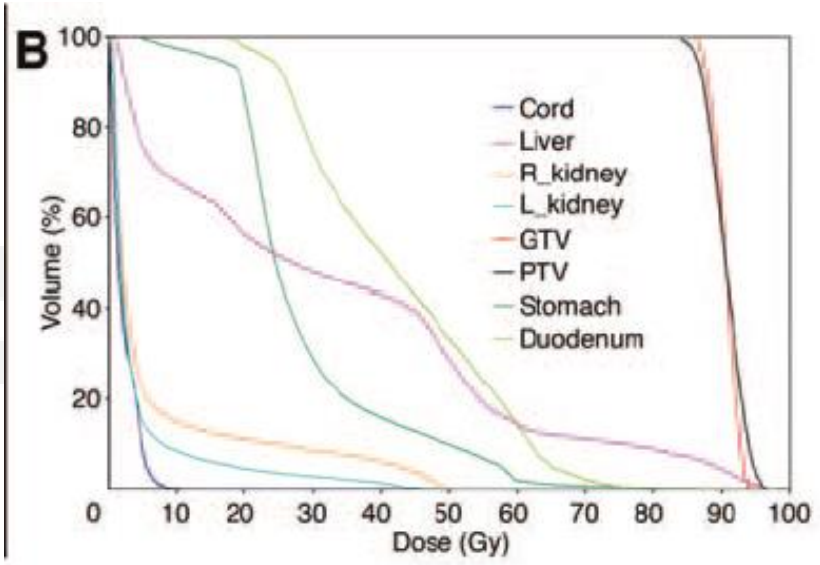
## 128 pacientes




| | Mediana SG Actual | Mediana SG Histórica |
|---|---|---|
| Metástasis Colorectales | 17.2 | 9 |
| Colangio-carcinoma | 13.3 | 9 |
| Hepatocarcinoma | 15.2 | 8 |


A
B
C


A
2
3
R
L


B
100
80
60
40
20
Volume (%)
0
10
20
30
40
50
60
70
80
90
100
Dose (Gy)
Cord
Liver
R_kidney
L_kidney
GTV
PTV
Stomach
Duodenum

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# ¿Cómo aumentar la dosis sin aumentar la toxicidad?

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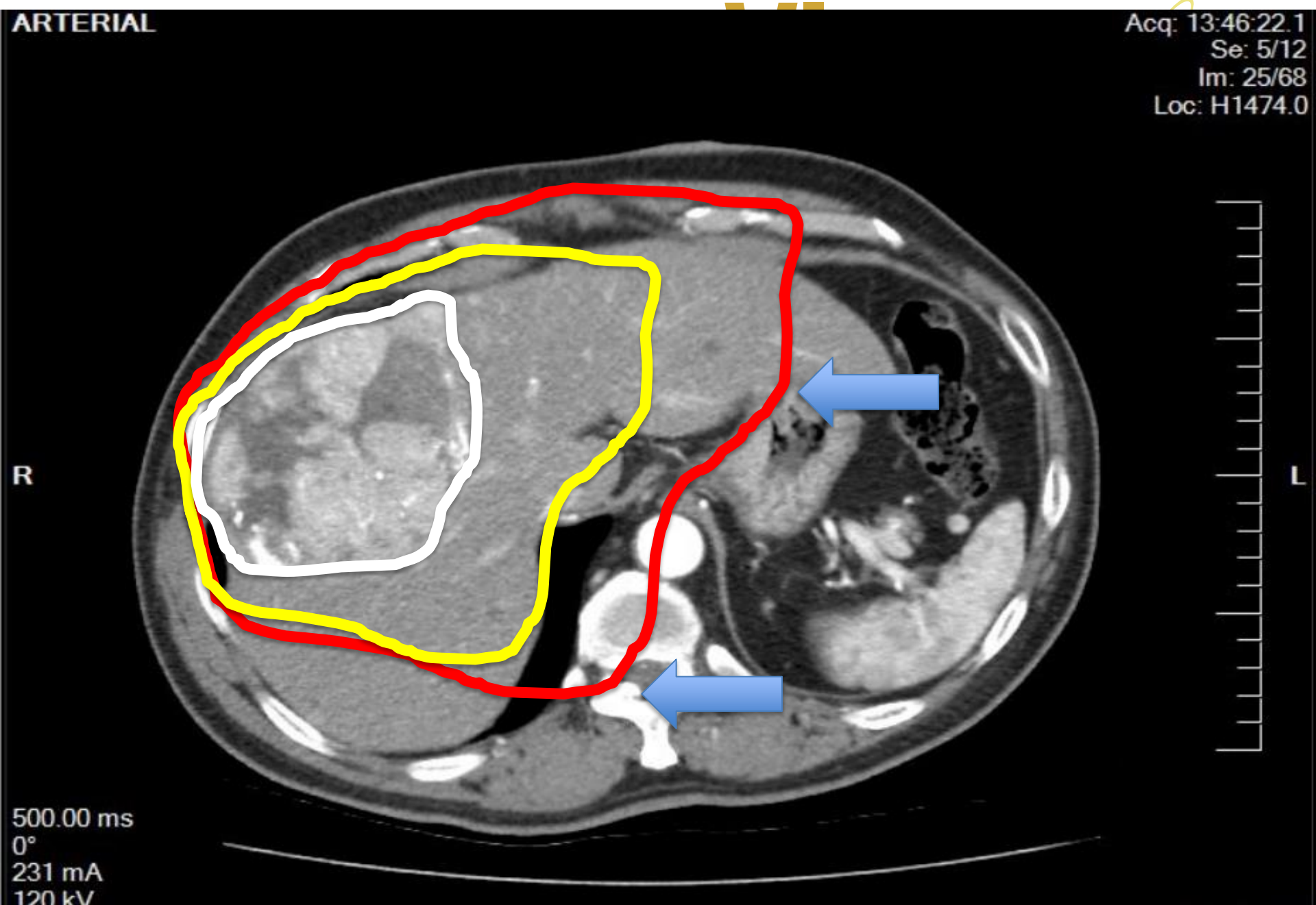
ARTERIAL
Acq: 13:46:22.1
Se: 5/12
Im: 25/68
Loc: H1474.0
R
L
500.00 ms
0°
231 mA
120 kV

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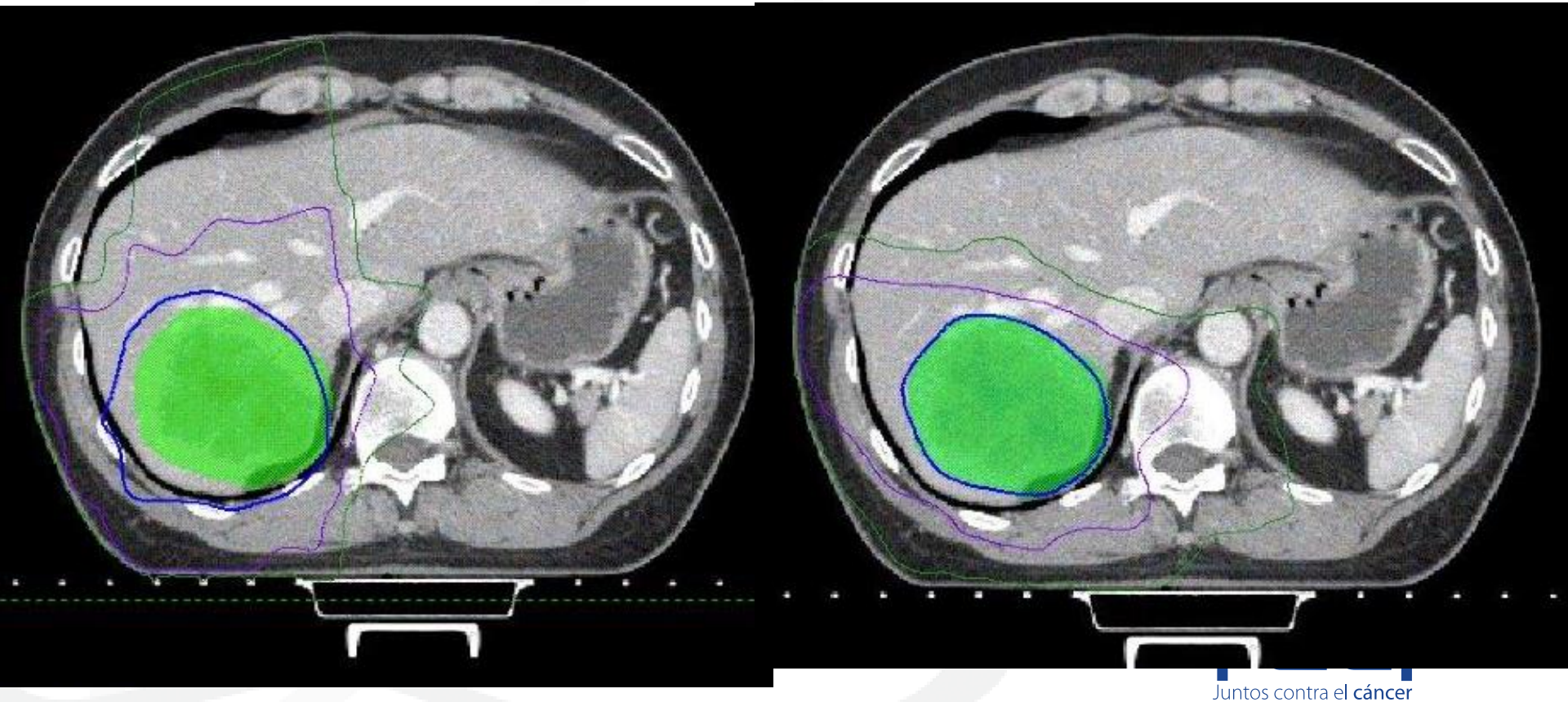
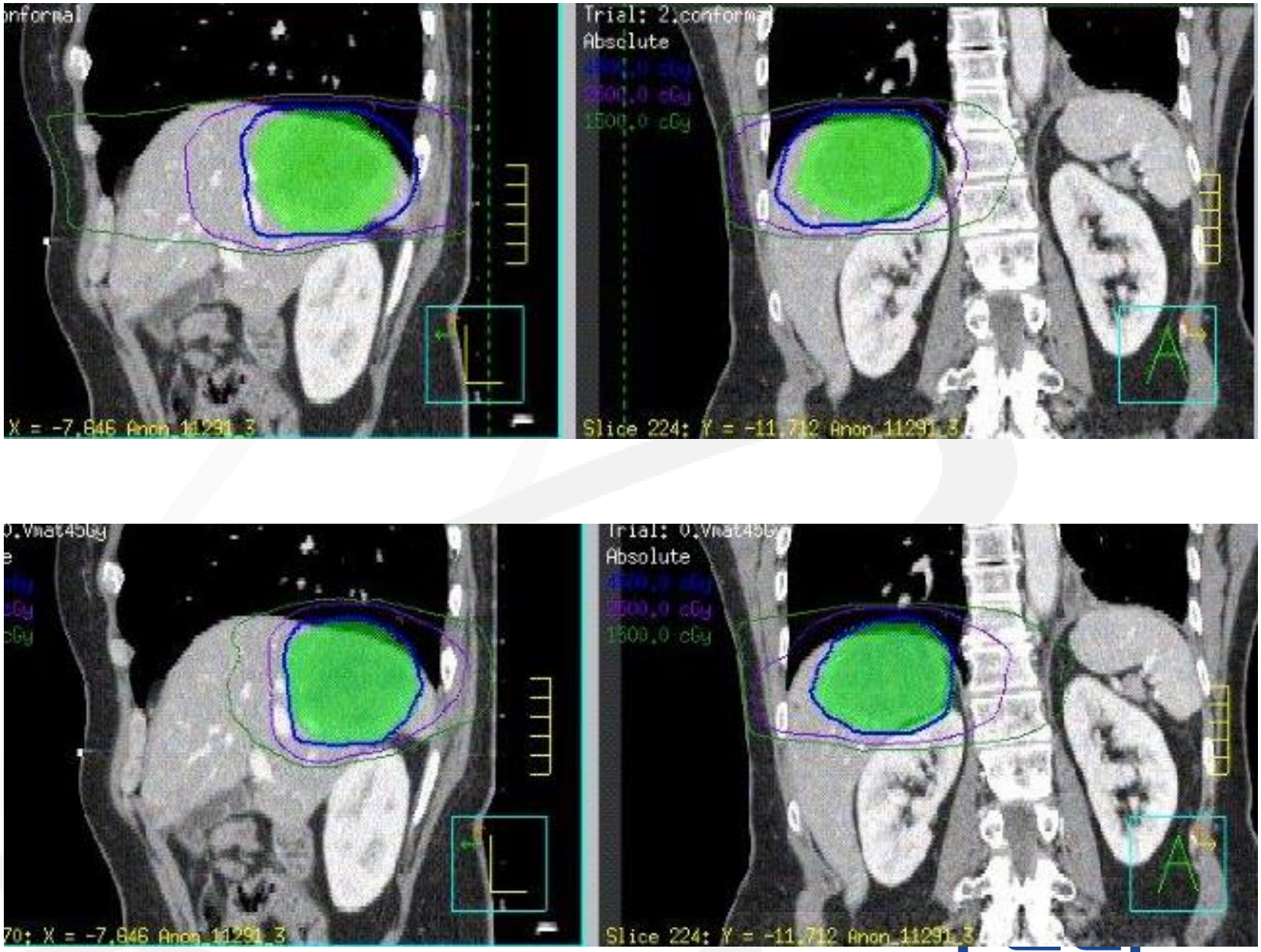
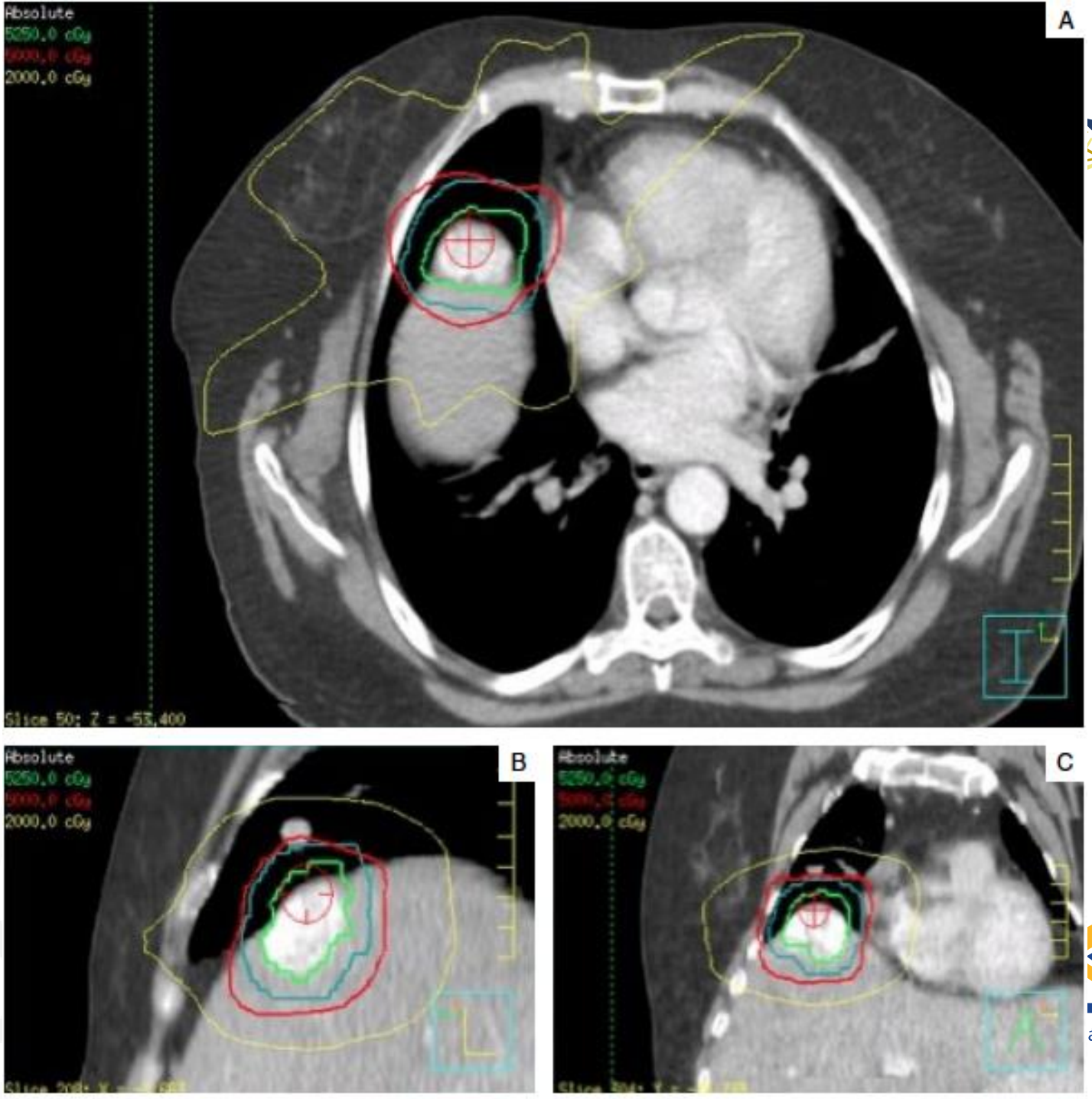


Juntos contra el cáncer


Trial: 2.conformal
Absolute
1500.0 cGy
Slice 224: Y = -11.712 Anon_11291_3
Trial: 0.Vmat45Gy
Absolute
1500.0 cGy
Slice 224: Y = -11.712 Anon_11291_3


Absolute
5250.0 cGy
2000.0 cGy
A
Slice 50: Z = -53,400
Absolute
5250.0 cGy
2000.0 cGy
B
Absolute
5250.0 cGy
2000.0 cGy
C

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# Mayor tecnología, mejores posibilidades

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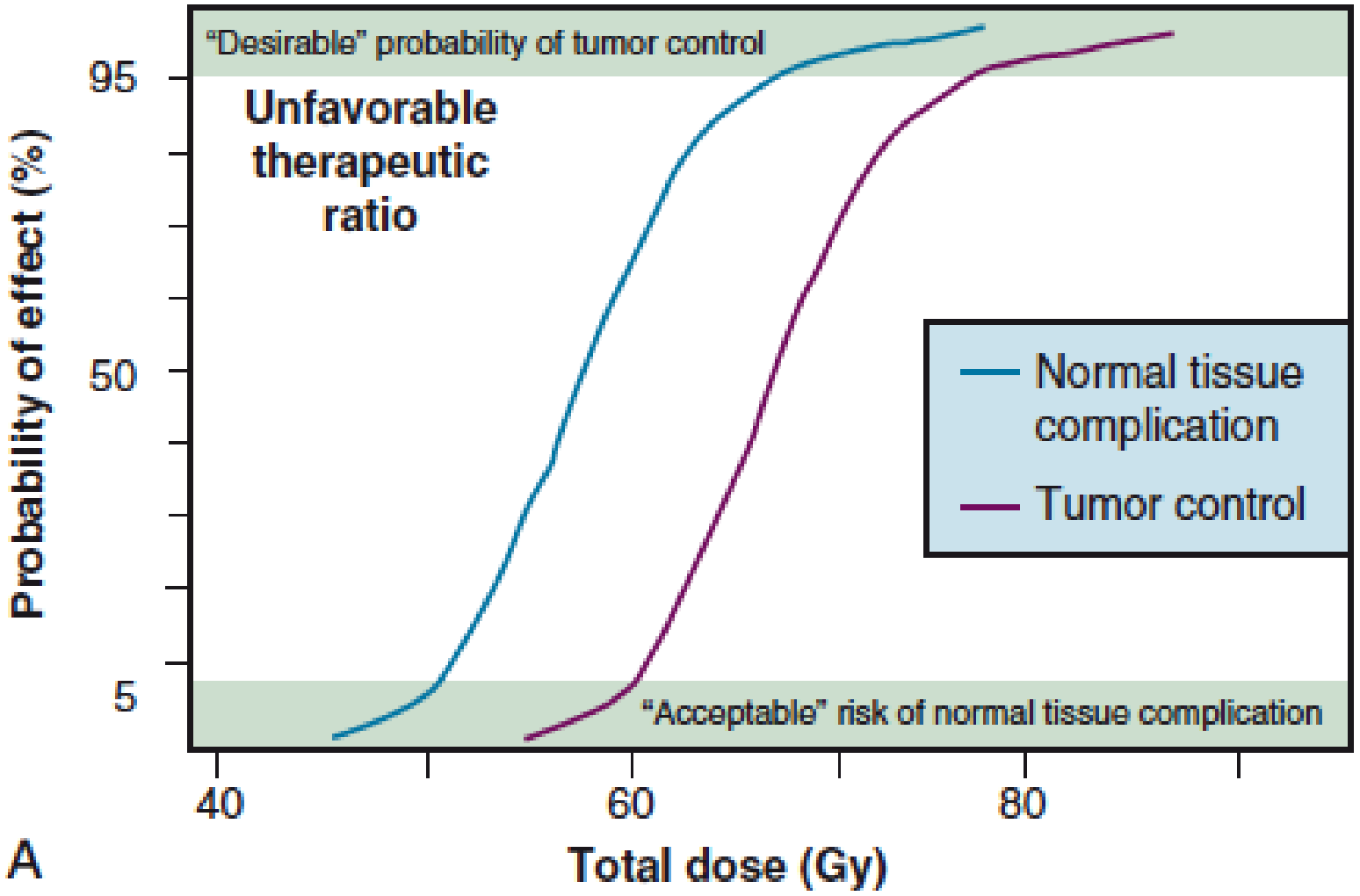
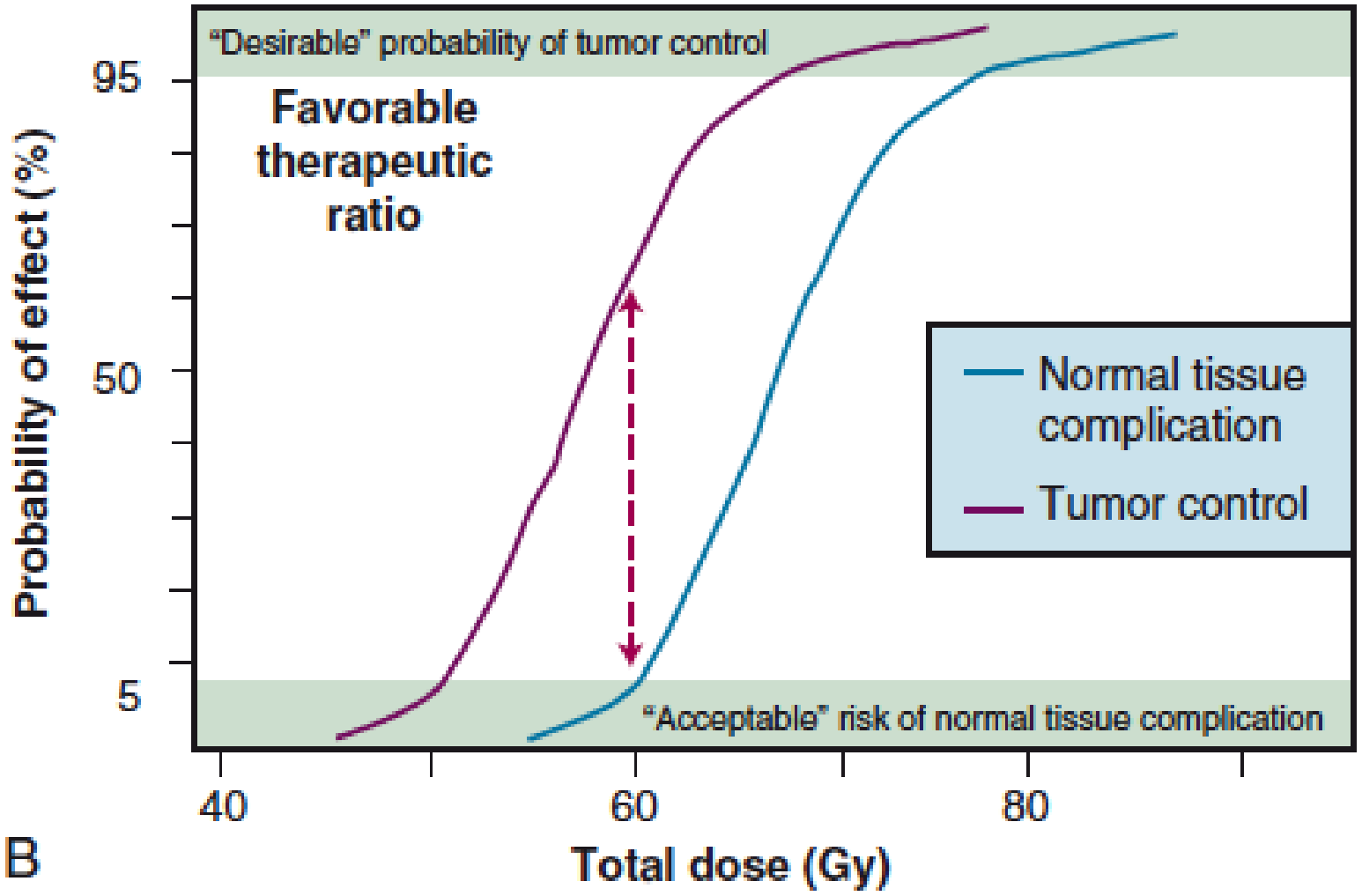
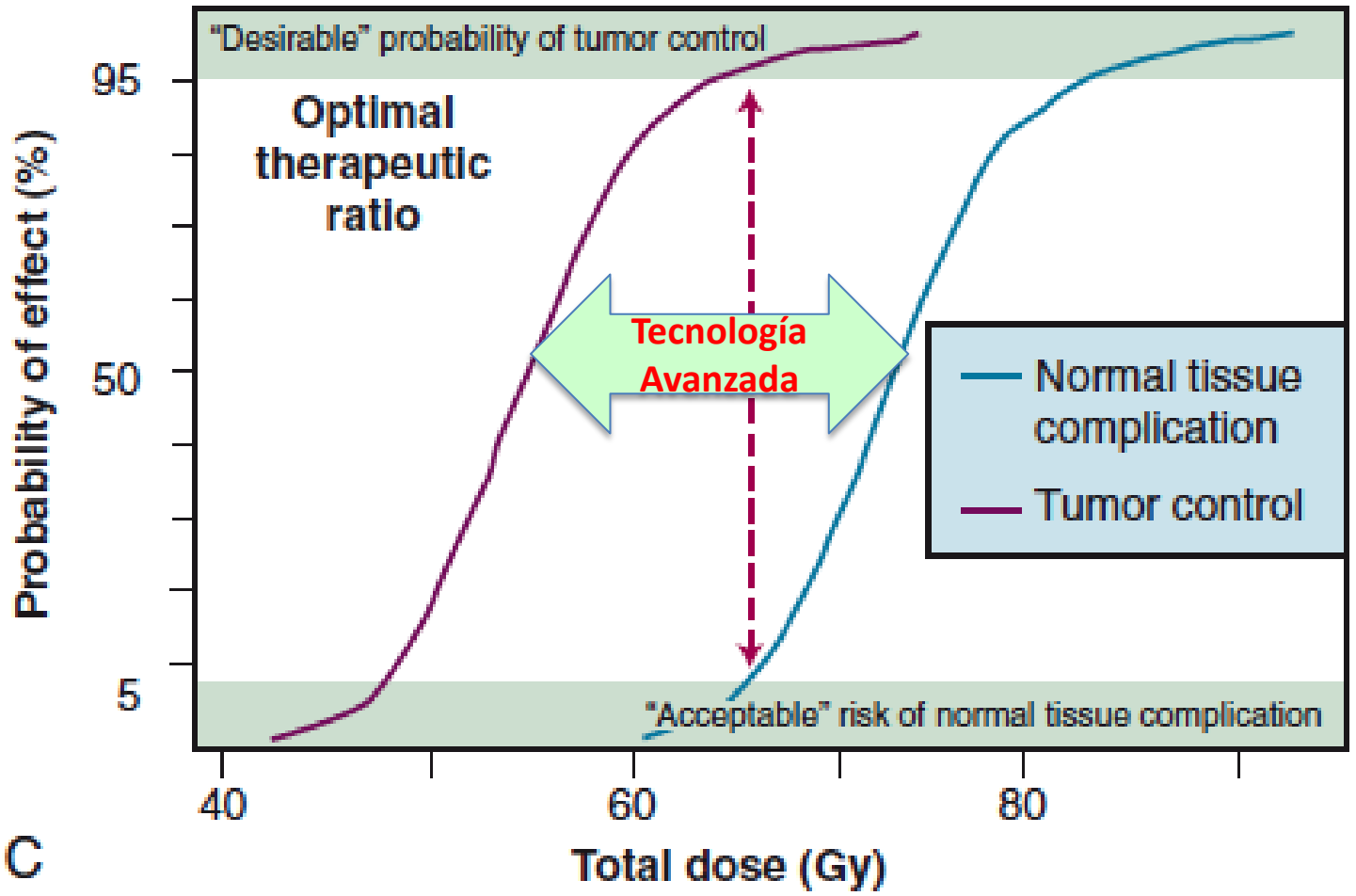
# Lo que sucedía antes....



# Lo que sucede ahora....



# Lo que podemos lograr




Jameson and Longo, NEJM, 2015

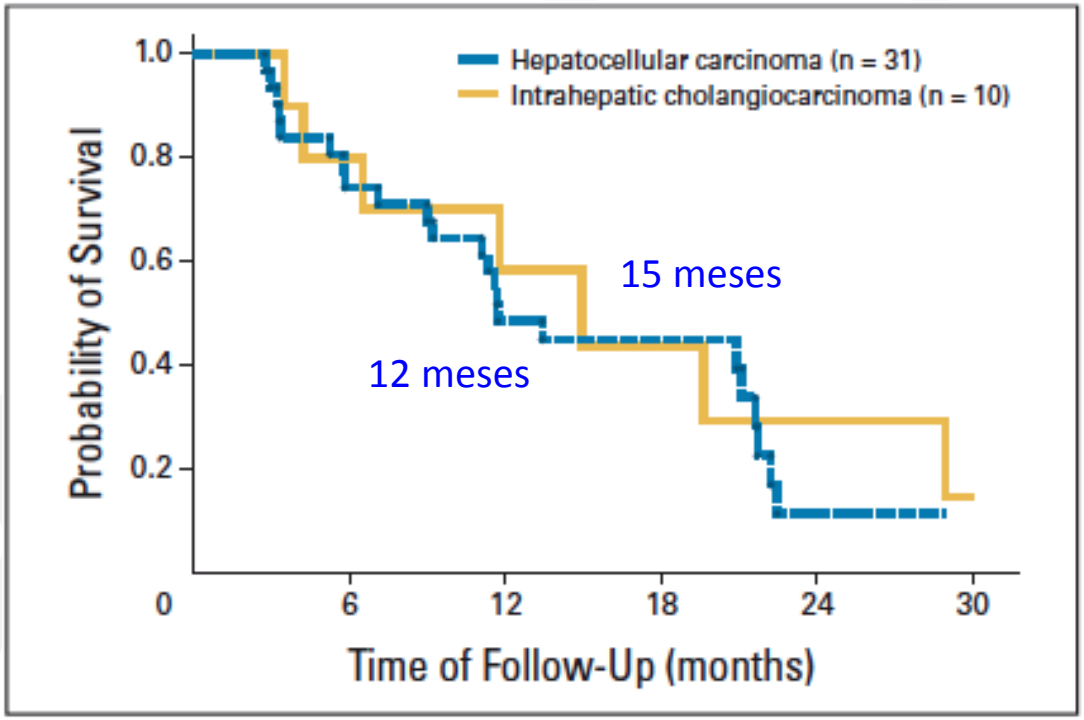
VOLUME 26 · NUMBER 4 · FEBRUARY 1 2008

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

# Phase I Study of Individualized Stereotactic Body Radiotherapy for Hepatocellular Carcinoma and Intrahepatic Cholangiocarcinoma

*Regina V. Tse, Maria Hawkins, Gina Lockwood, John J. Kim, Bernard Cummings, Jennifer Knox, Morris Sherman, and Laura A. Dawson*




## Toxicidad Grado 3

| | Hepatocel (N=31) | Colangio (N=10) |
|---|---|---|
| Enzimas | 8 | 2 |
| Bilirrubina | 2 | 1 |
| Albúmina | 0 | 0 |
| Plaquetas | 1 | 0 |
| Fatiga | 1 | 0 |
| Nausea | 3 | 0 |

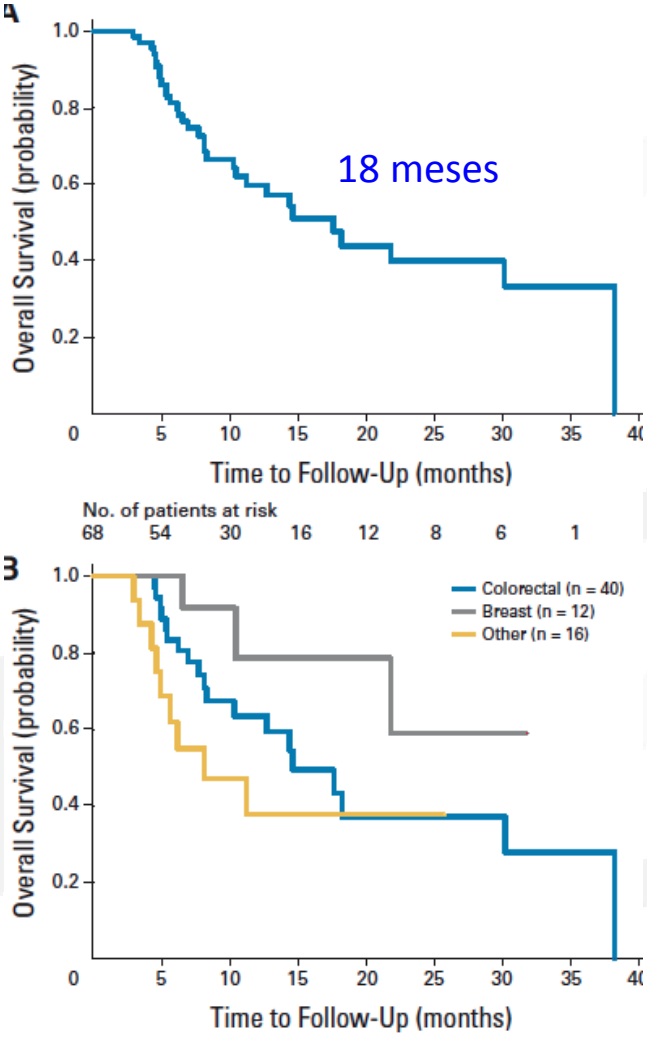
VOLUME 27 · NUMBER 10 · APRIL 1 2009

JOURNAL OF CLINICAL ONCOLOGY ORIGINAL REPORT

# Phase I Study of Individualized Stereotactic Body Radiotherapy of Liver Metastases

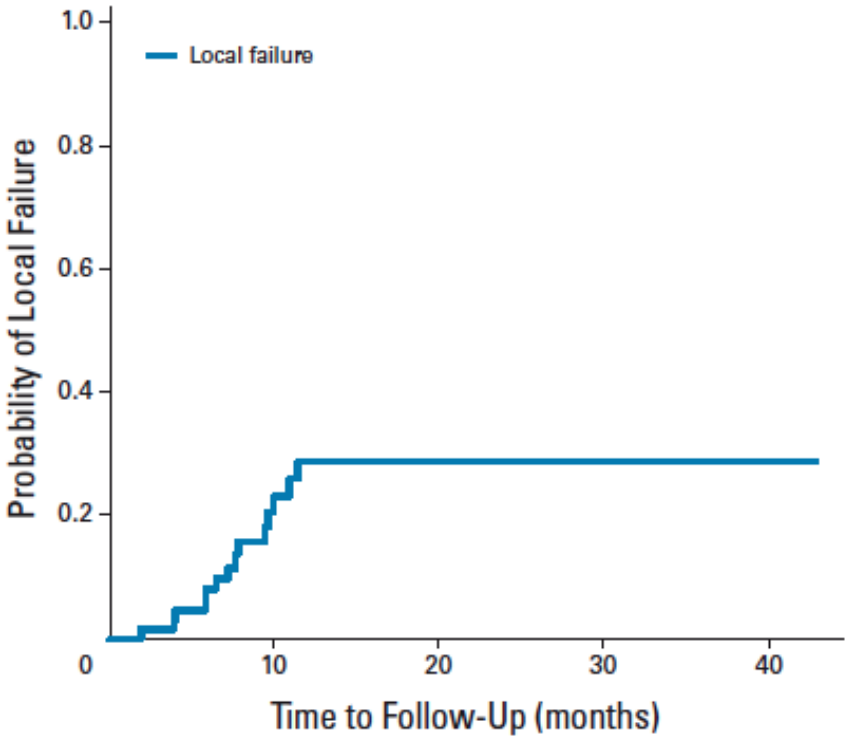
*Mark T. Lee, John J. Kim, Robert Dinniwell, James Brierley, Gina Lockwood, Rebecca Wong, Bernard Cummings, Jolie Ringash, Regina V. Tse, Jennifer J. Knox, and Laura A. Dawson*






18 meses

- 68 pacientes
- 143 tumores



VOLUME 31 · NUMBER 13 · MAY 1 2013

JOURNAL OF CLINICAL ONCOLOGY

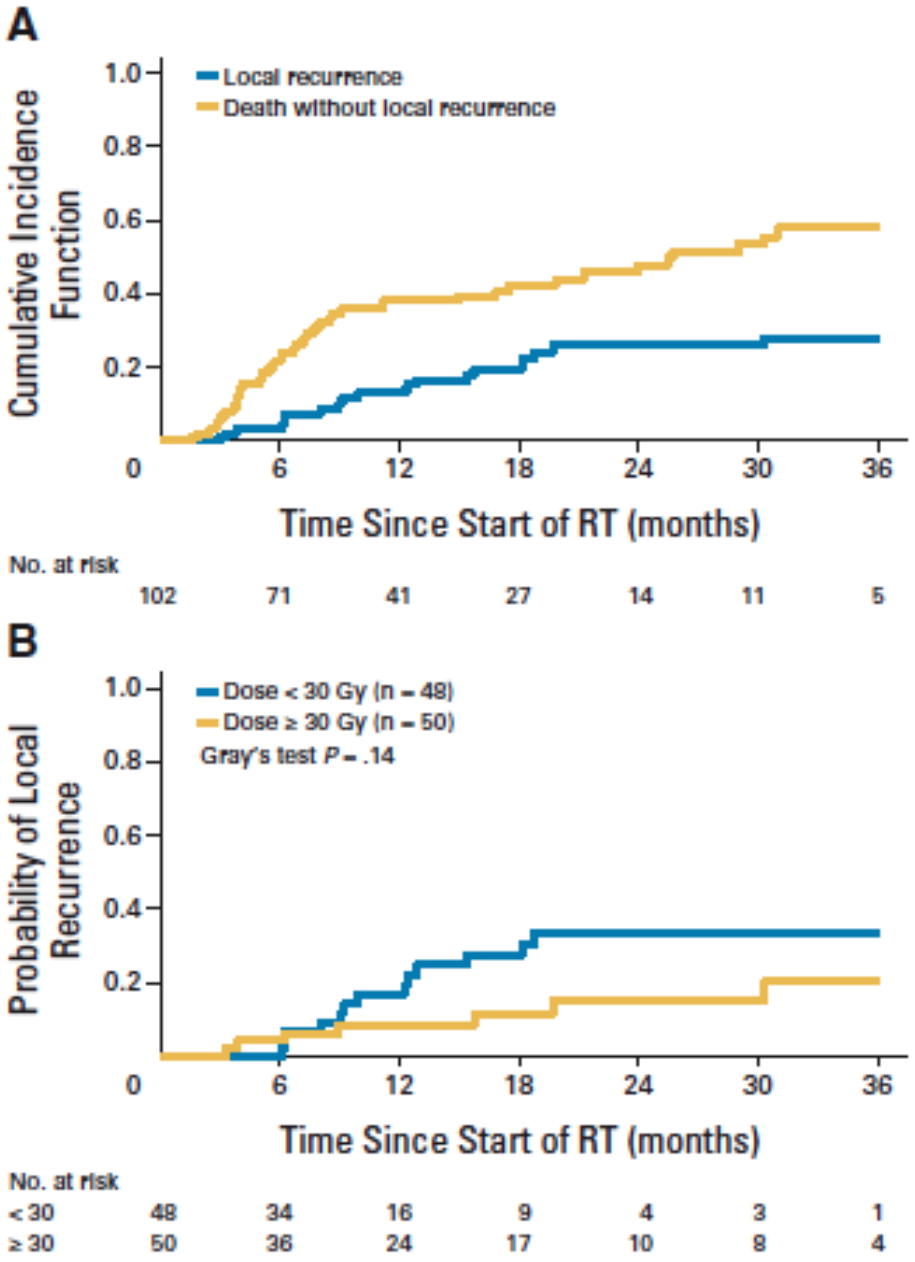
ORIGINAL REPORT

# Sequential Phase I and II Trials of Stereotactic Body Radiotherapy for Locally Advanced Hepatocellular Carcinoma

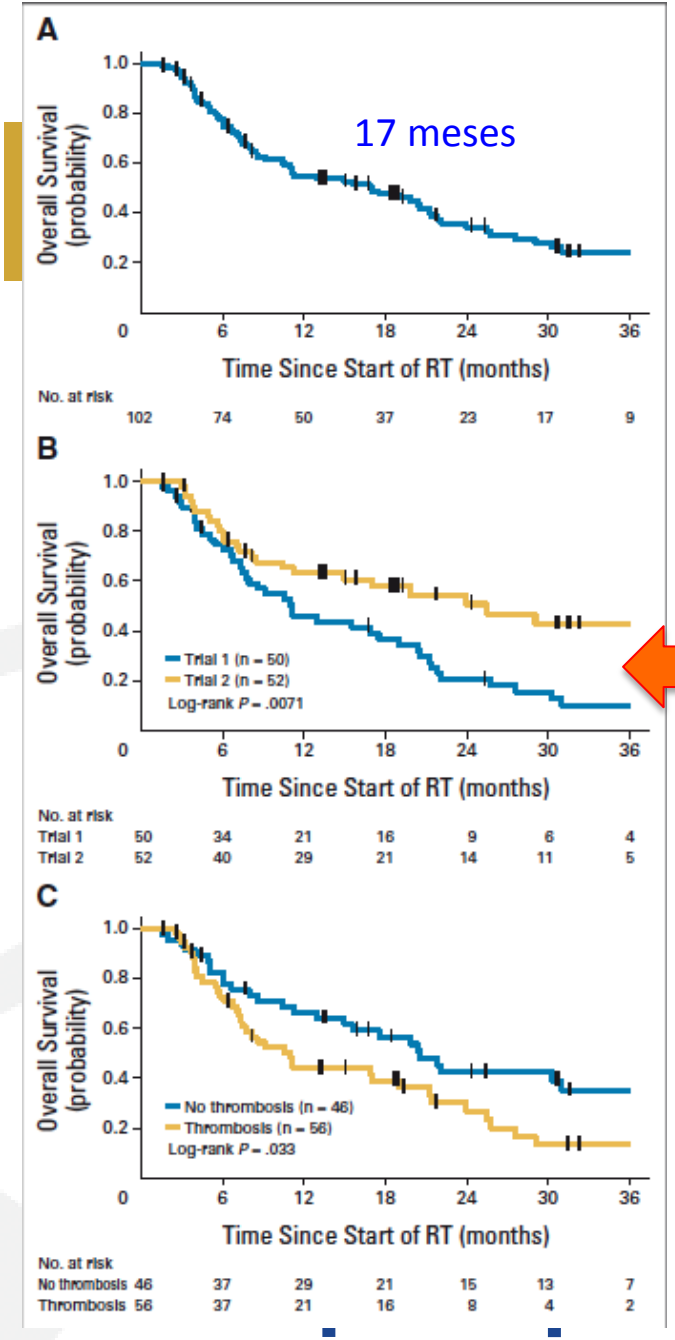
*Alexis Bujold, Christine A. Massey, John J. Kim, James Brierley, Charles Cho, Rebecca K.S. Wong, Rob E. Dinniwell, Zahra Kassam, Jolie Ringash, Bernard Cummings, Jenna Sykes, Morris Sherman, Jennifer J. Knox, and Laura A. Dawson*

**Table 1.** Patient and Treatment Characteristics (continued)

| Variable | Total (102 patients) No. | Total (102 patients) % | Trial 1 (50 patients) No. | Trial 1 (50 patients) % | Trial 2 (52 patients) No. | Trial 2 (52 patients) % |
|---|---|---|---|---|---|---|
| TNM stage† | | | | | | |
| I | 13 | 12.8 | 4 | 8.0 | 9 | 17.3 |
| II | 14 | 13.7 | 7 | 14.0 | 7 | 13.5 |
| III | 67 | 65.7 | 35 | 70.0 | 32 | 61.5 |
| IV | 8 | 7.8 | 4 | 8.0 | 4 | 7.7 |
| Tumor vascular thrombosis | 56 | 54.9 | 27 | 54.0 | 29 | 55.8 |
| Extrahepatic disease | 12 | 11.8 | 5 | 10.0 | 7 | 13.5 |
| Baseline AFP, nmol/L | | | | | | |
| Median | 163 | | 502 | | 113 | |
| Range | < 6-714,500 | | < 6-714,500 | | < 6-159,572 | |
| Multiple lesions at baseline | 62 | 60.8 | 36 | 72.0 | 26 | 50.0 |
| Sum of largest diameters of liver lesions, cm | | | | | | |
| Median | 9.9 | | 10.5 | | 9.4 | |
| Range | 1.8-43.3 | | 1.8-43.3 | | 2.0-18.6 | |
| Size of largest lesion, cm | | | | | | |
| Median | 7.2 | | 7.2 | | 7.3 | |
| Range | 1.4-23.1 | | 1.8-23.1 | | 1.4-17.8 | |


A
Cumulative Incidence Function
Local recurrence
Death without local recurrence
Time Since Start of RT (months)
No. at risk
102 71 41 27 14 11 5
B
Probability of Local Recurrence
Dose < 30 Gy (n = 48)
Dose ≥ 30 Gy (n = 50)
Gray's test P = .14
Time Since Start of RT (months)
No. at risk
< 30 48 34 16 9 4 3 1
≥ 30 50 36 24 17 10 8 4

VI


A
Overall Survival (probability)
17 meses
Time Since Start of RT (months)
No. at risk
102 74 50 37 23 17 9
B
Overall Survival (probability)
Trial 1 (n = 50)
Trial 2 (n = 52)
Log-rank P = .0071
Time Since Start of RT (months)
No. at risk
Trial 1 50 34 21 16 9 6 4
Trial 2 52 40 29 21 14 11 5
C
Overall Survival (probability)
No thrombosis (n = 46)
Thrombosis (n = 56)
Log-rank P = .033
Time Since Start of RT (months)
No. at risk
No thrombosis 46 37 29 21 15 13 7
Thrombosis 56 37 21 16 8 4 2

# Expansión del uso de Radioterapia

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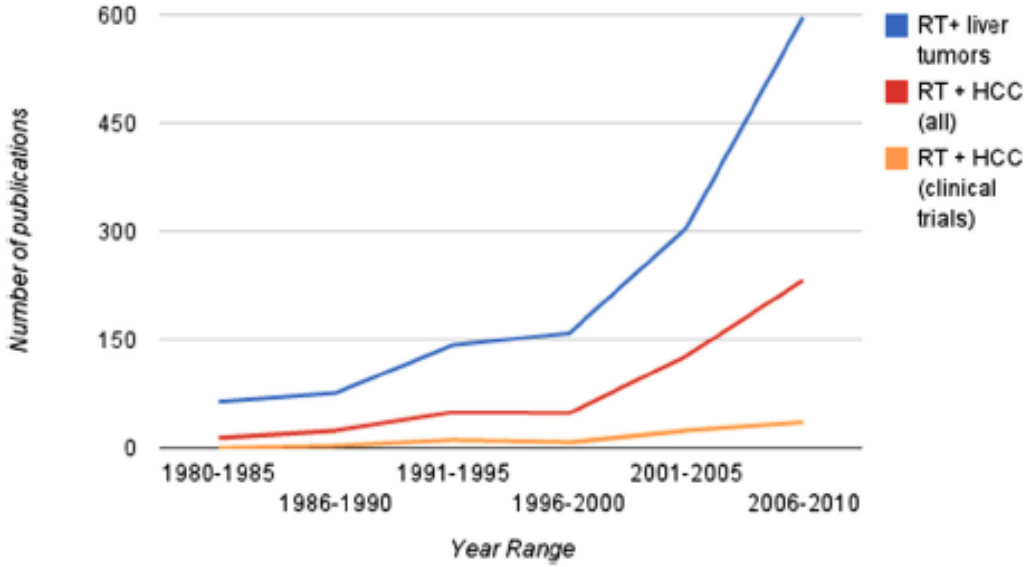
| Study | Institution | Year | Design | No. of patients | CP class | Tumor size (range) | TVT | Dose (Gy), median (range) | Fx | 1-year OS | 1-year LC | Grade ≥3 toxicity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bujold et al. [51] | Princess Margaret Hospital, Canada | 2013 | Phase I/II | 102 | A | 1.4–23.1 cm | 55% | 36 (24–54) | 6 | 55% | 87% | 36% |
| Méndez Romero et al. [52] | Erasmus MC, Netherlands | 2006 | Phase I/II | 8 | A, B | 0.5–7.2 cm | 25% | 25–37.5 | 3–5 | 75% | 75% | 12.50% |
| Kang et al. [53] | KIRMS, Korea | 2012 | Phase II | 47 | A, B | 1.3–8 cm | 11% | 57 (42–60) | 3 | 69% at 2 years | 95% at 2 years | 26% |
| Cárdenes et al. [54] | Indiana University, USA | 2010 | Phase I | 17 | A, B | ≤6 cm (cumulative) | 18% | 36–48 | 3–4 | 75% | 100% | 18% |
| Tse et al. [46] | Princess Margaret Hospital, Canada | 2008 | Phase I | 31 | A | 9–1,913 mL | 42% | 36 (24–54) | 6 | 48% | 65%[a] | 26% |




Int J Radiation Oncol Biol Phys, Vol. 87, No. 1, pp. 22–32, 2013

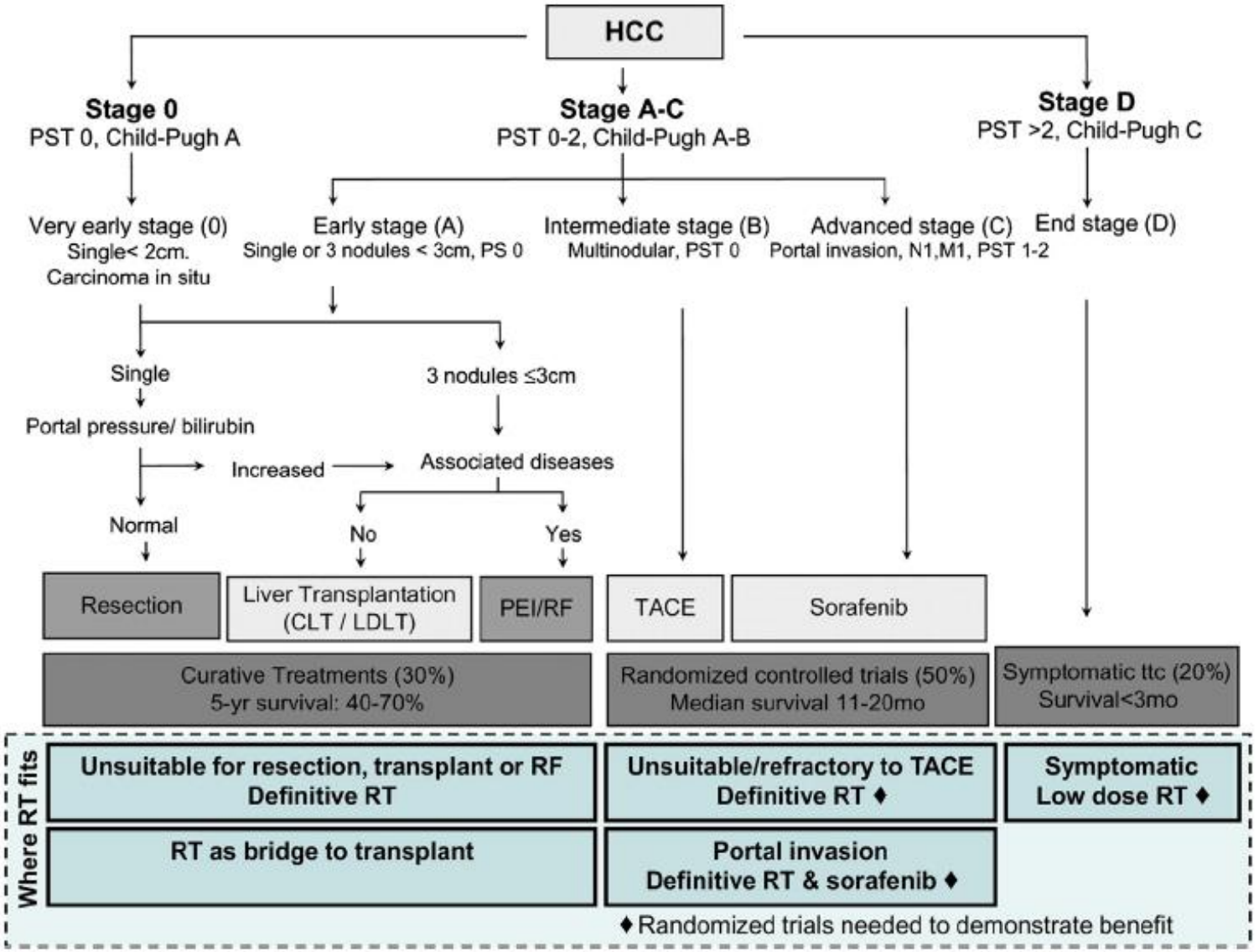
*The Oncologist* 2014;19:868–879

| Study | Institution | Year | Design | No. of patients | CP class | Tumor size (range) | TVT | Dose (Gy), median (range) | Fx | 1-year OS | 1-year LC | Grade ≥3 toxicity |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sanuki et al. [56] | Tokai University, Japan | 2013 | Retrospective | 185 | A, B | 0.8–5 cm | NR | 30–40 | 5 | 95% | 99% | 13% |
| Jang et al. [58] | KIRMS, Korea | 2013 | Retrospective | 108 | A, B | 1–7 cm | NR | 51 (33–60) | 3 | 63% at 2 years | 87% at 2 years | 10%[b] |
| Yoon et al. [59] | Asan Medical Center, Korea | 2013 | Retrospective | 93 | A, B | 1–6 cm | 0% | 30–60 | 3–4 | 86% | 95% | 6.5% RILD only |
| Bibault et al. [60] | Lille, France | 2013 | Retrospective | 75 | A, B | 3–4.4 cm | NR | 45 | 3 | 79% | 90% | 16%[b] |
| Honda et al. [61] | Hiroshima | | | | | | | | | | 100% | 7% |
| Yuan et al. [62] | Tianjin Me University, | | | | | | | | | | 93% | 4.5% grade ≥2 |
| Huang et al. [63] | Taipei, Tai | | | | | | | | | at rs | 98% | 3% |
| Andolino et al. [64] | Indiana University, USA | | | | | | NR | (24–48) | | at 2 years | 90% at 2 years | 37% |
| Son et al. [65] | Gyeongsang University, Korea | 2010 | Retrospective | 47 | A, B, C | 3.0–81.3 mL | NR | 30–39 | 3 | NR | NR | 33% grade ≥2 |
| Kwon et al. [66] | Catholic University, Korea | 2010 | Retrospective | 42 | A, B | 3.0–81.8 mL | 0% | 30–39 | 3 | 93% | 72% | 2% |
| Seo et al. [67] | KIRMS, Korea | 2010 | Retrospective | 38 | A, B | <10 cm | NR | 33–57 | 3–4 | 69% | 79% | 3% |
| Louis et al. [68] | Liege, Belgium | 2010 | Retrospective | 25 | A, B | 1.8–10 cm | 16% | 45 | 3 | 79% | 95% | 8% |
| Goyal et al. [69] | Case Western Reserve University, USA | 2010 | Retrospective | 6 | NR | 5–22 cm | NR | 24–45 | 1–3 | 83% | 100% at 9 months | 0% |

Control Local es cercano al 90%
Toxicidad grado 3 < 15%

*The Oncologist* 2014;19:868–879

# ¿Un rol para la radioterapia?






Int J Radiation Oncol Biol Phys, Vol. 87, No. 1, pp. 22–32, 2013

National Comprehensive Cancer Network®

# NCCN Guidelines Version 3.2017
# Hepatocellular Carcinoma

NCCN Guidelines Index
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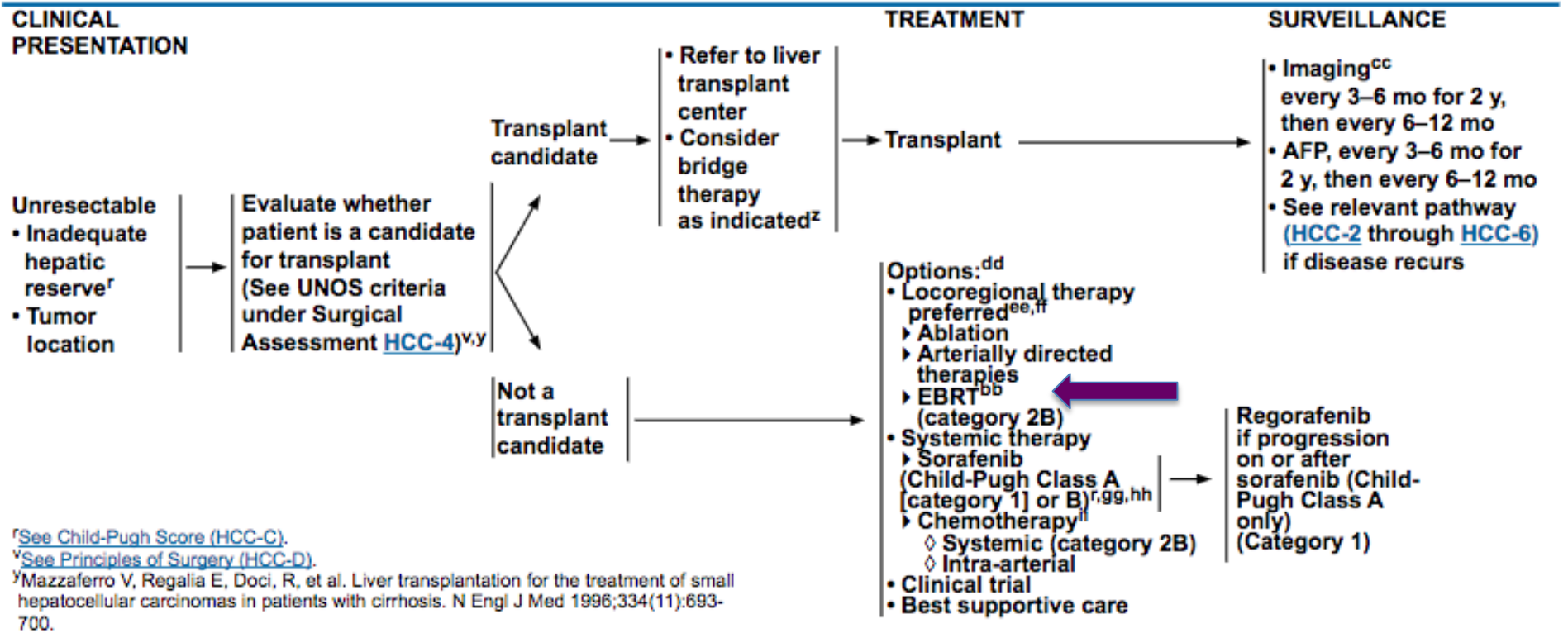
Discussion




[r] See Child-Pugh Score (HCC-C).
[v] See Principles of Surgery (HCC-D).
[y] Mazzaferro V, Regalia E, Doci, R, et al. Liver transplantation for the treatment of small hepatocellular carcinomas in patients with cirrhosis. N Engl J Med 1996;334(11):693-700.
[z] Many transplant centers consider bridge therapy for transplant candidates.

JOURNAL OF CLINICAL ONCOLOGY ORIGINAL REPORT

# Outcomes After Stereotactic Body Radiotherapy or Radiofrequency Ablation for Hepatocellular Carcinoma

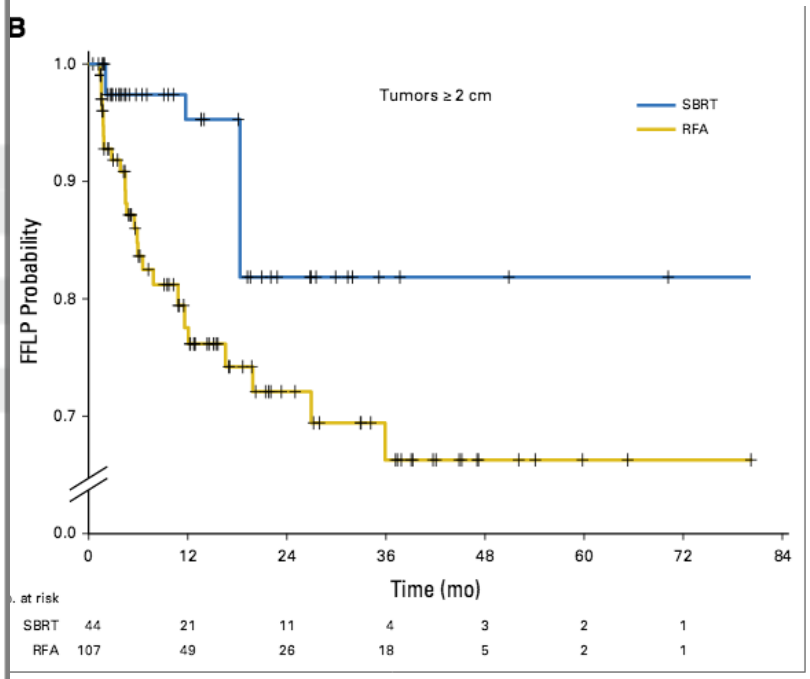
*Daniel R. Wahl, Matthew H. Stenmark, Yebin Tao, Erqi L. Pollom, Elaine M. Caoili, Theodore S. Lawrence, Matthew J. Schipper, and Mary Feng*

**Table 3.** Multivariate Cox Proportional Hazards Analysis of Factors Associated With Local Progression

| | HR | 95% CI | *P* |
|---|---|---|---|
| Treatment | | | |
| RFA *v* SBRT | 3.84 | 1.62 to 9.09 | .002 |
| Age | 1.01 | 0.97 to 1.06 | .514 |
| Tumor size | 1.35 | 0.99 to 1.84 | .055 |
| Child-Pugh score | 0.95 | 0.74 to 1.22 | .703 |
| AFP | 1.12 | 0.97 to 1.30 | .130 |
| No. prior treatments | 1.25 | 1.00 to 1.56 | .055 |

NOTE. Age (per year), tumor size (per cm), Child-Pugh score (per point), AFP (per doubling) and No. prior treatments (per treatment) were treated as continuous variables.

Abbreviations: AFP, alpha-fetoprotein; HR, hazard ratio; RFA, radiofrequency ablation; SBRT, stereotactic body radiation therapy.



Journal of Gastroenterology and Hepatology
JGHF
doi:10.1111/jgh.12087

HEPATOLOGY

# Stereotactic body radiation therapy combined with transcatheter arterial chemoembolization for small hepatocellular carcinoma

Yohji Honda,* Tomoki Kimura,† Hiroshi Aikata,* Tomoki Kobayashi,* Takayuki Fukuhara,* Keiichi Masaki,* Takashi Nakahara,* Noriaki Naeshiro,* Atsushi Ono,* Daisuke Miyaki,* Yuko Nagaoki,* Tomokazu Kawaoka,* Shintaro Takaki,* Akira Hiramatsu,* Masaki Ishikawa,‡ Hideaki Kakizawa,‡ Masahiro Kenjo,† Shoichi Takahashi,* Kazuo Awai,‡ Yasushi Nagata† and Kazuaki Chayama*

*Departments of Gastroenterology and Metabolism, †Radiation Oncology and ‡Diagnostic Radiology, Graduate School of Biomedical Sciences, Hiroshima University Hospital, Hiroshima, Japan



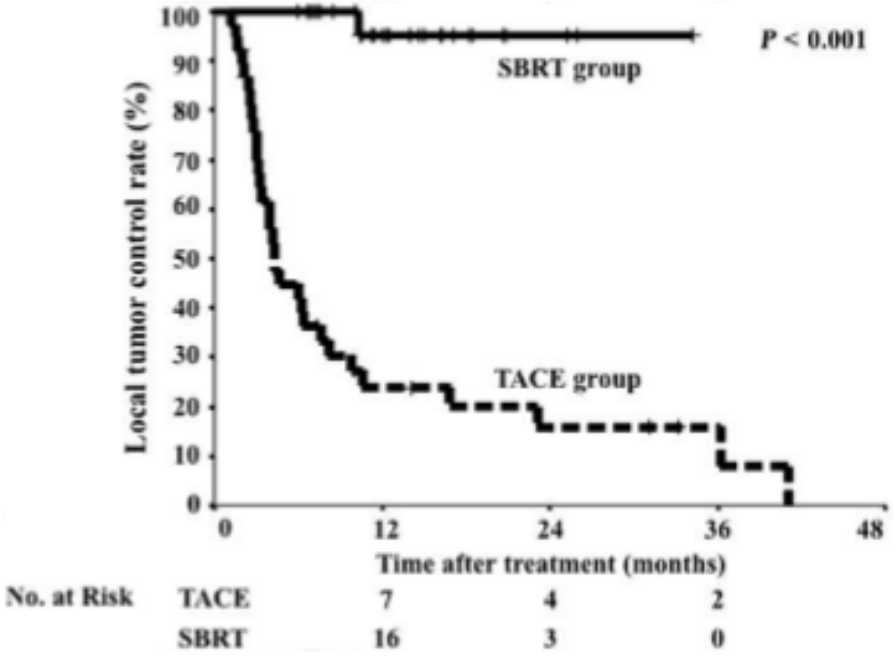



**Figure 2** Local tumor control rate according to treatment modality. SBRT, stereotactic body radiation therapy; TACE, transcatheter arterial chemoembolization.

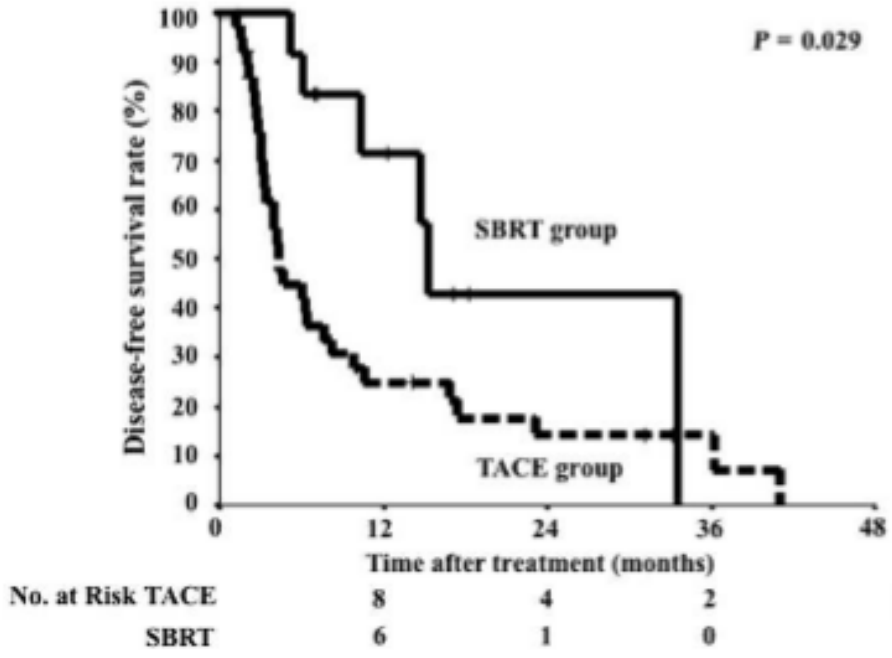



**Figure 3** Disease-free survival rate according to treatment modality. SBRT, stereotactic body radiation therapy; TACE, transcatheter arterial chemoembolization.

# Puente a trasplante

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## Accepted Manuscript

Stereotactic body radiotherapy versus TACE or RFA as a bridge to transplant in patients with hepatocellular carcinoma. An intention-to-treat analysis

G. Sapisochin, A. Barry, M. Doherty, S. Fischer, N. Goldaracena, Roizar Rosales, Moises Russo, R. Beecroft, A. Ghanekar, M. Bhat, J. Brierley, P.D. Greig, J.J Knox, L.A. Dawson, D.R. Grant

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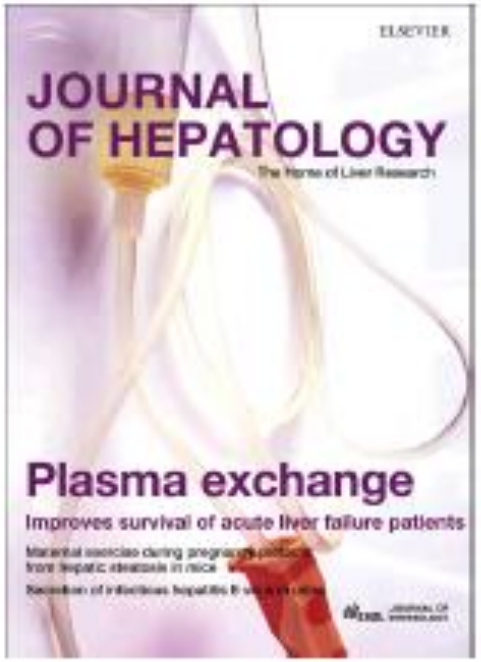
DOI: http://dx.doi.org/10.1016/j.jhep.2017.02.022
Reference: JHEPAT 6438

To appear in: *Journal of Hepatology*




falp
Juntos contra el cáncer

Figure 1

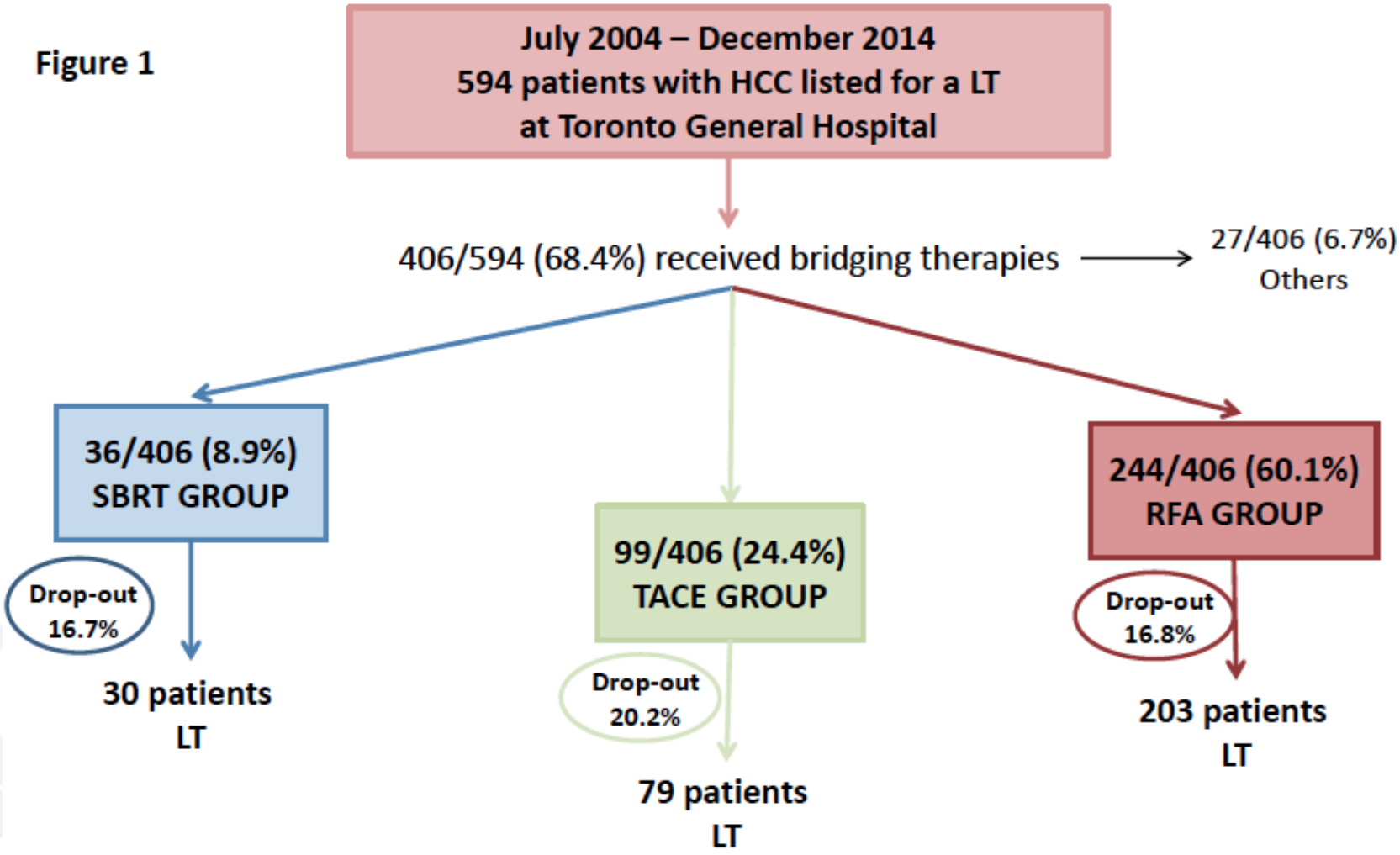
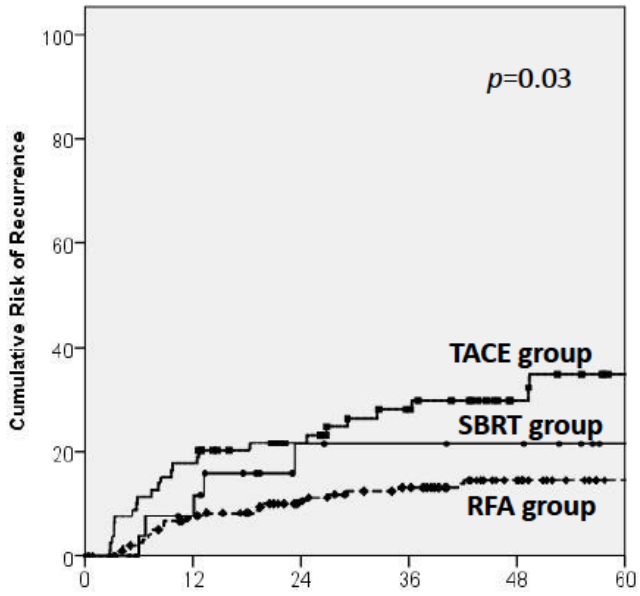
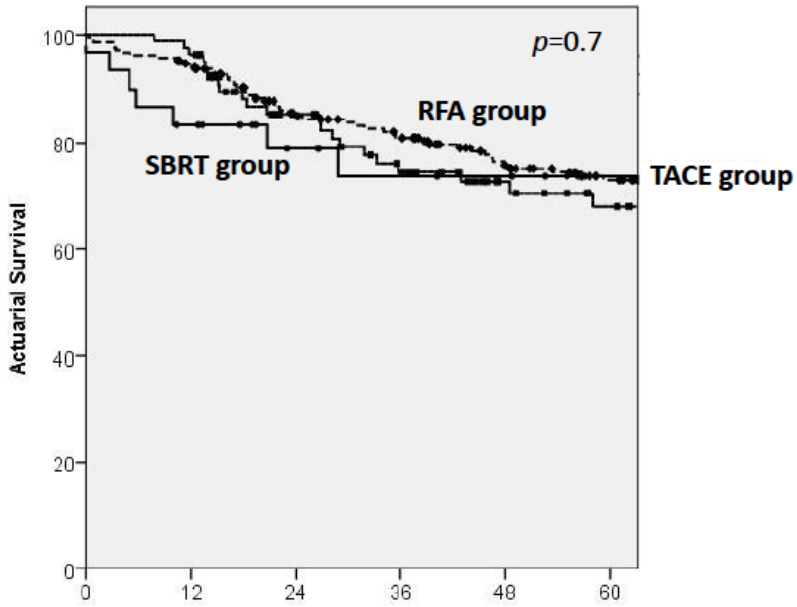

July 2004 – December 2014
594 patients with HCC listed for a LT
at Toronto General Hospital
406/594 (68.4%) received bridging therapies
27/406 (6.7%)
Others
36/406 (8.9%)
SBRT GROUP
99/406 (24.4%)
TACE GROUP
244/406 (60.1%)
RFA GROUP
Drop-out
16.7%
Drop-out
20.2%
Drop-out
16.8%
30 patients
LT
79 patients
LT
203 patients
LT

**Figure 3**



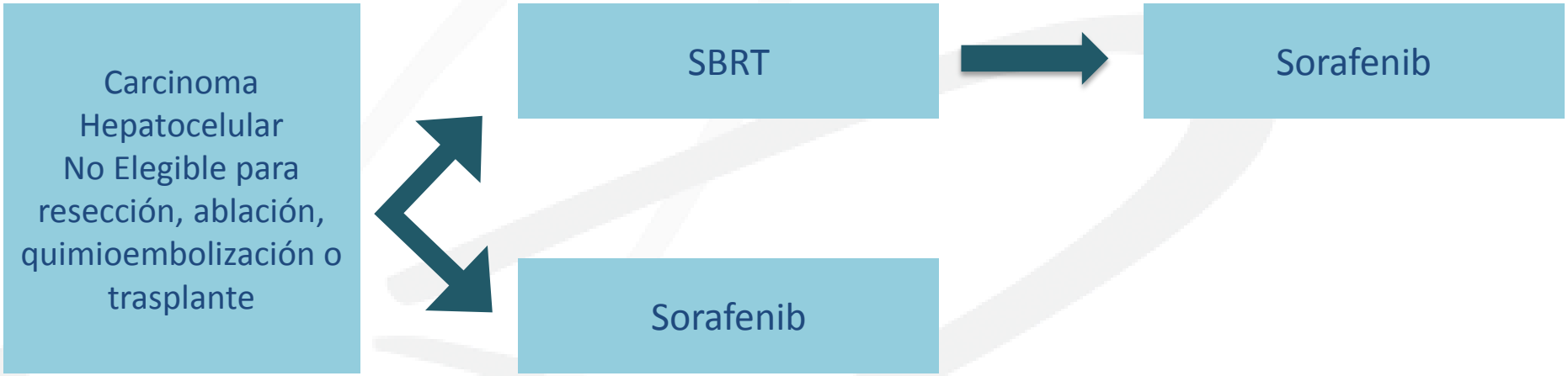

| Patients at risk | | | | | | |
|---|---|---|---|---|---|---|
| SBRT group | 30 | 24 | 15 | 12 | 11 | 7 |
| TACE group | 79 | 65 | 55 | 42 | 33 | 23 |
| RFA group | 203 | 176 | 146 | 133 | 111 | 97 |

**Figure 5**




| Patients at risk | | | | | | |
|---|---|---|---|---|---|---|
| SBRT group | 30 | 25 | 18 | 14 | 13 | 9 |
| TACE group | 79 | 76 | 61 | 47 | 38 | 29 |
| RFA group | 203 | 189 | 151 | 139 | 115 | 99 |

# RTOG 1112 Reclutando



# Limitaciones a Organos en Riesgo

| Organ at risk | Dose constraints (QUANTEC) (conventional fractionation unless otherwise noted) | Dose constraints from [60] (5 fractions) |
|---|---|---|
| Liver | ≥700 cc of normal liver receives ≤15 Gy in 3–5 fractions<br>Mean normal liver dose: <15 Gy in 3 fractions or <20 Gy in 6 fractions | Liver—GTV mean dose ≤13 Gy (based on Child–Pugh a cirrhosis patients with HCC) |
| Spinal cord | Max dose <50 Gy (0.2% risk myelopathy) | Max dose ≤25 Gy to 0.5 cc |
| Stomach | $D_{100}$ <45 Gy (<7% risk ulceration) | Max dose ≤30 Gy to 0.5 cc |
| Small bowel | $V_{45}$ <195 cc (<10% risk grade 3 + toxicity) (peritoneal cavity) | Max dose ≤30 Gy to 0.5 cc |
| Large bowel/Esophagus | | Max dose ≤32 Gy to 0.5 cc |
| Bilateral kidneys | Mean dose <15–18 Gy (< 5% risk clinical dysfunction) | Mean dose ≤10 Gy |
| Chest wall | | Max dose ≤50 Gy to 0.5 cc |

# Caso Clínico

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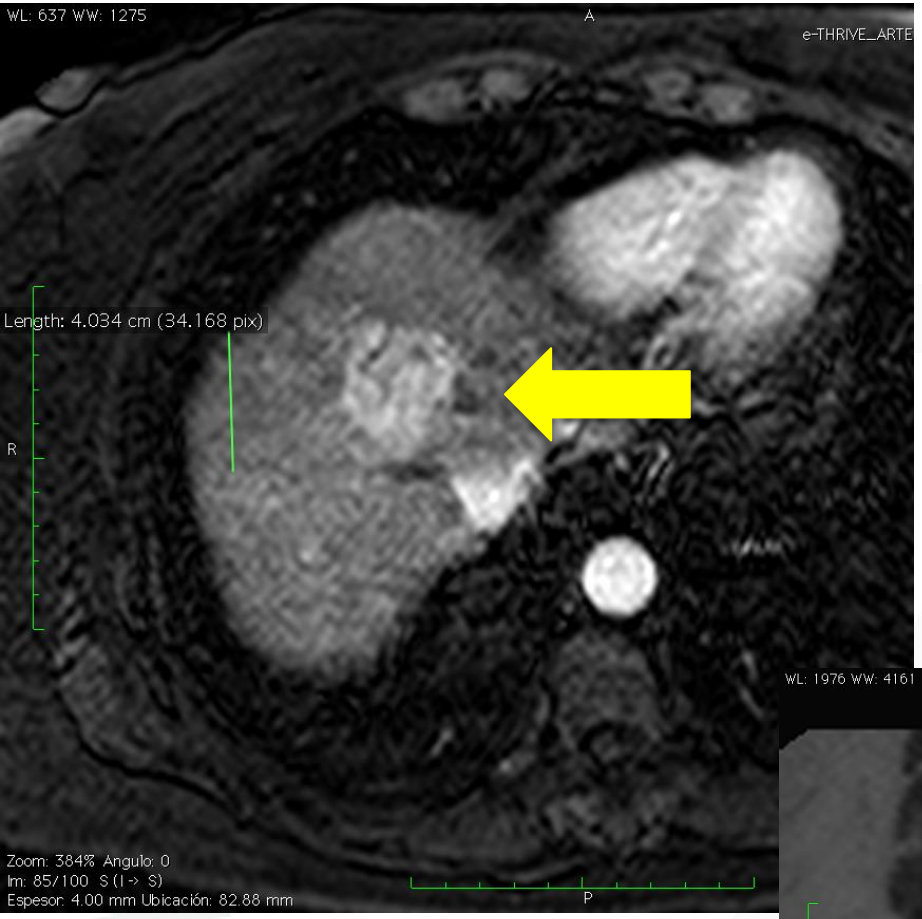


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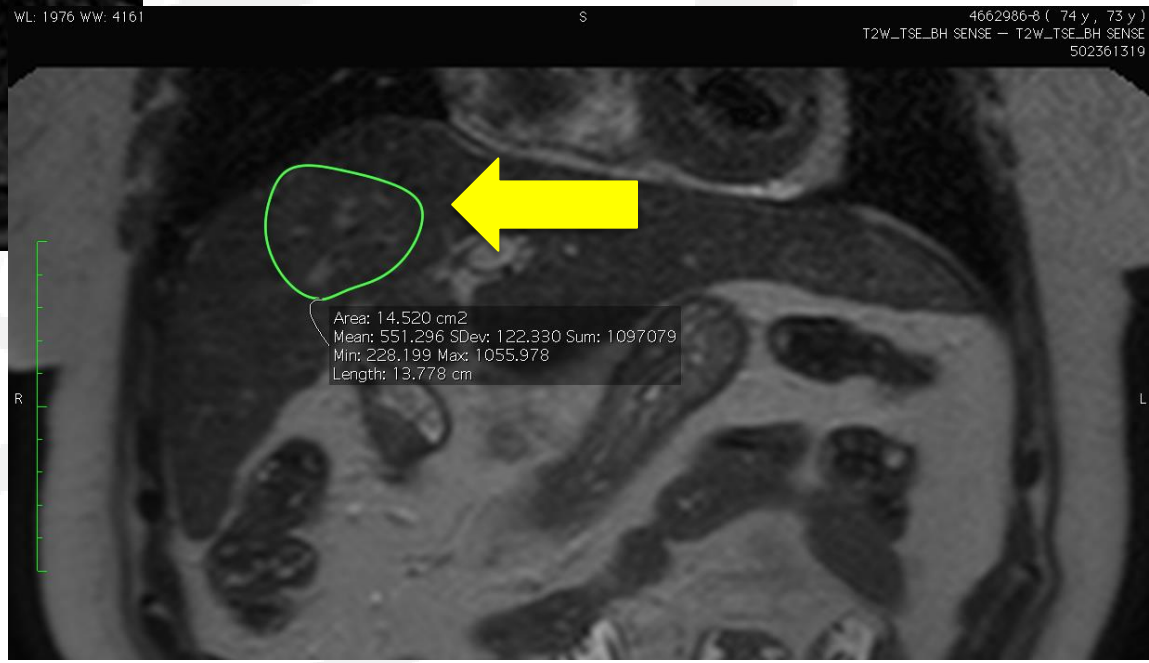
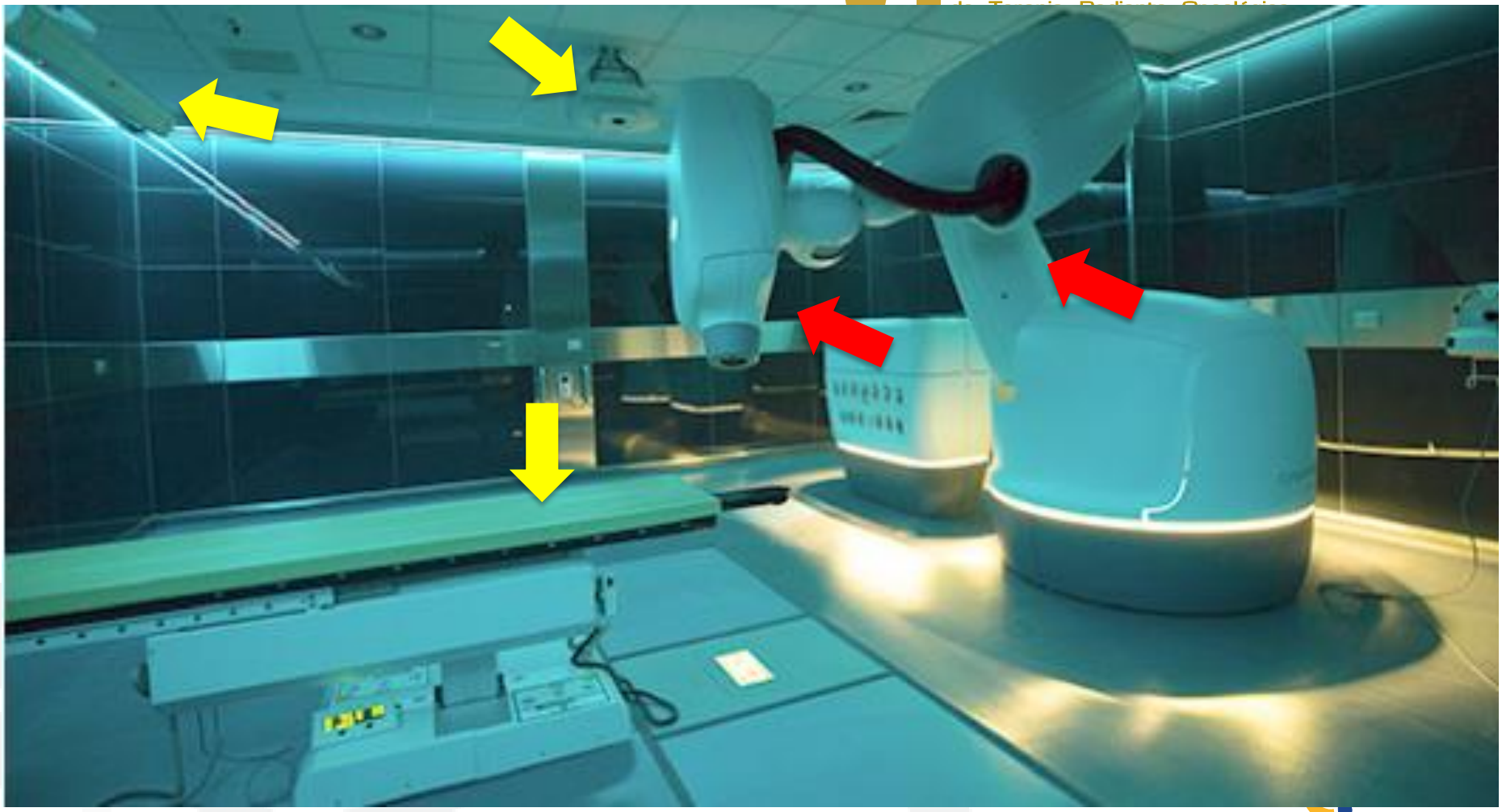
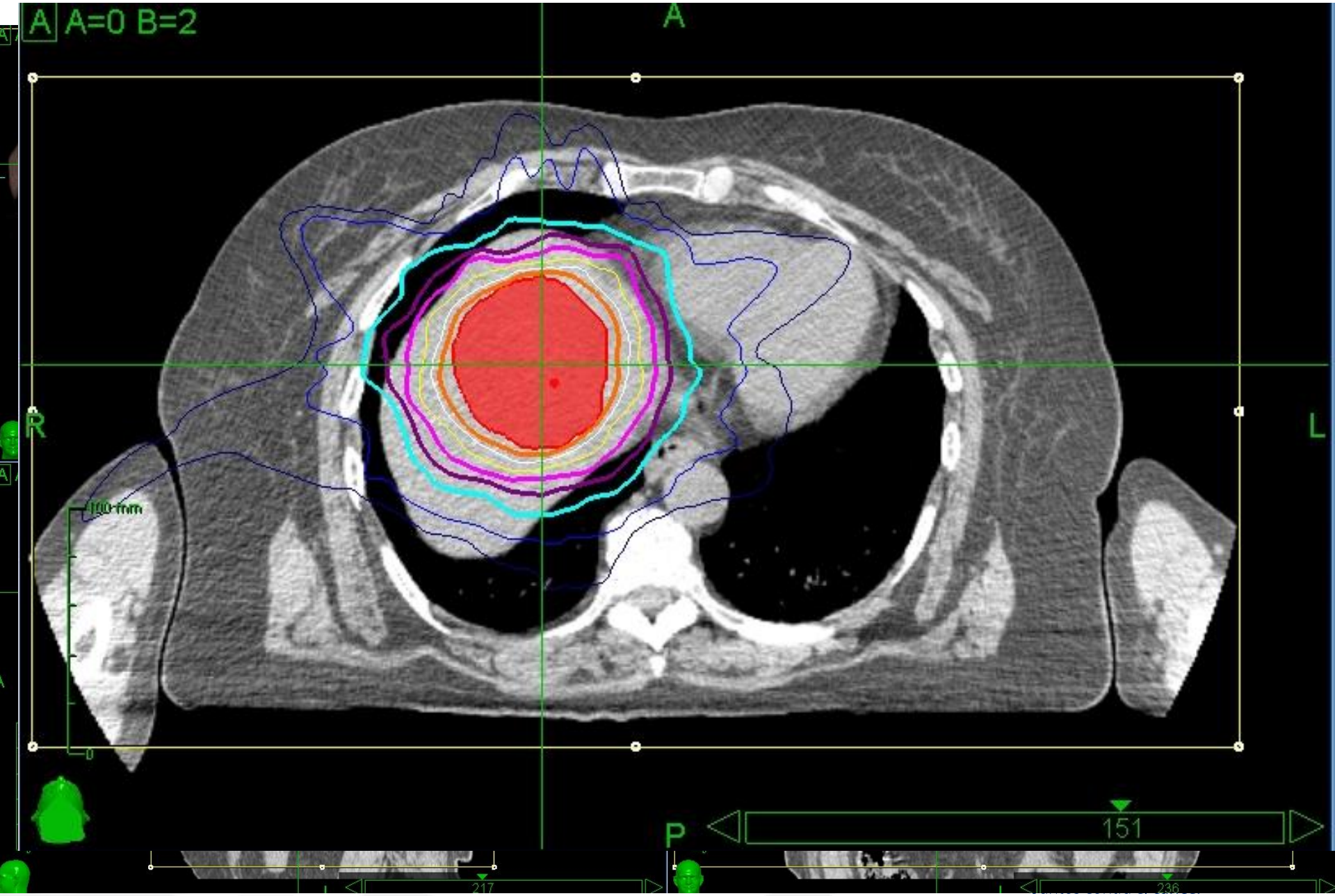
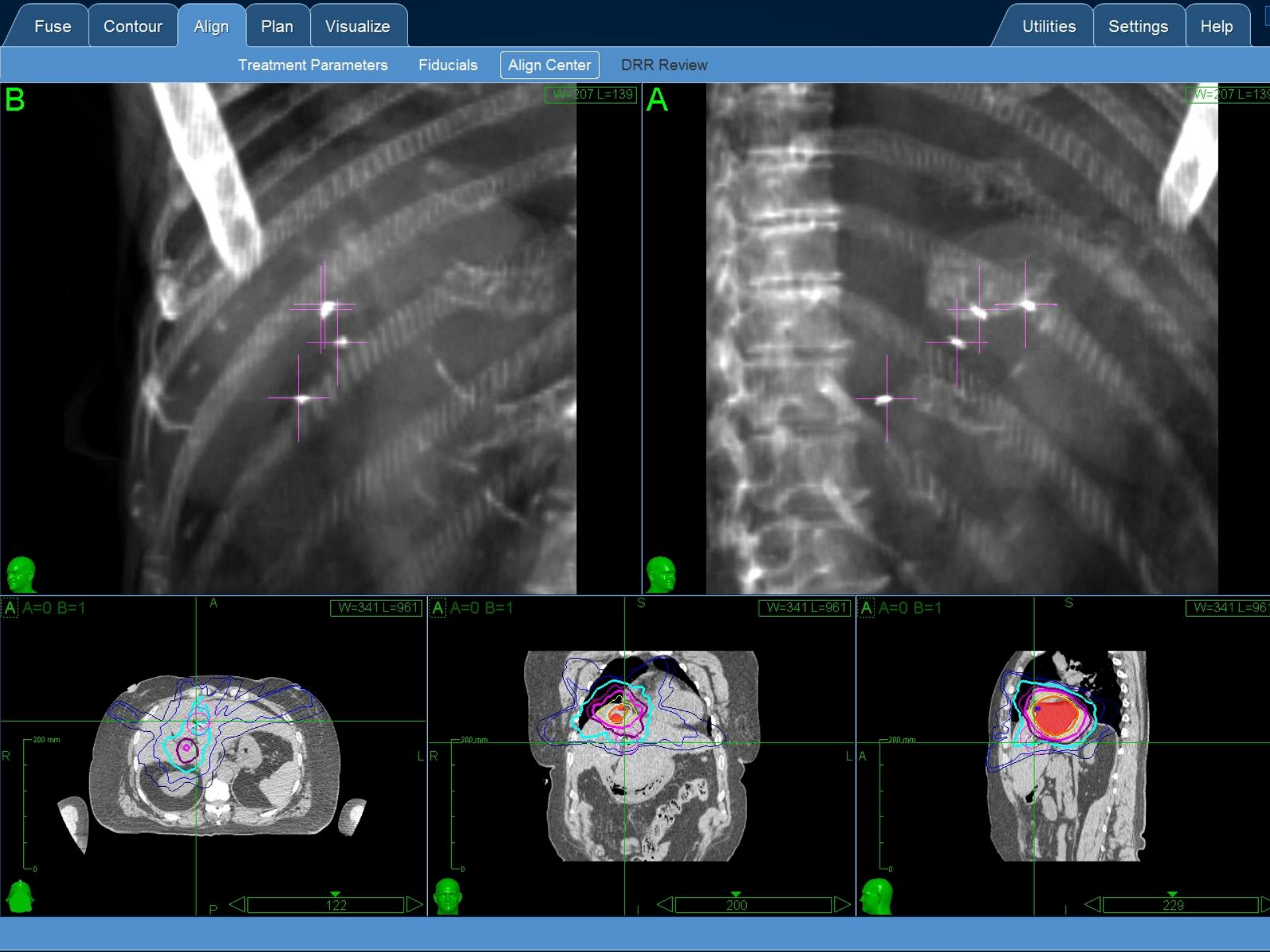


# Ejemplo de un tratamiento




A A=0 B=2
A
R
L
100 mm
0
P
151
217
236


Fuse
Contour
Align
Plan
Visualize
Utilities
Settings
Help
Treatment Parameters
Fiducials
Align Center
DRR Review
B
W=207 L=139
A
W=207 L=139
A A=0 B=1
W=341 L=961
200 mm
R
L
P
122
A A=0 B=1
S
W=341 L=961
200 mm
R
L
I
200
A A=0 B=1
S
W=341 L=961
200 mm
A
I
229

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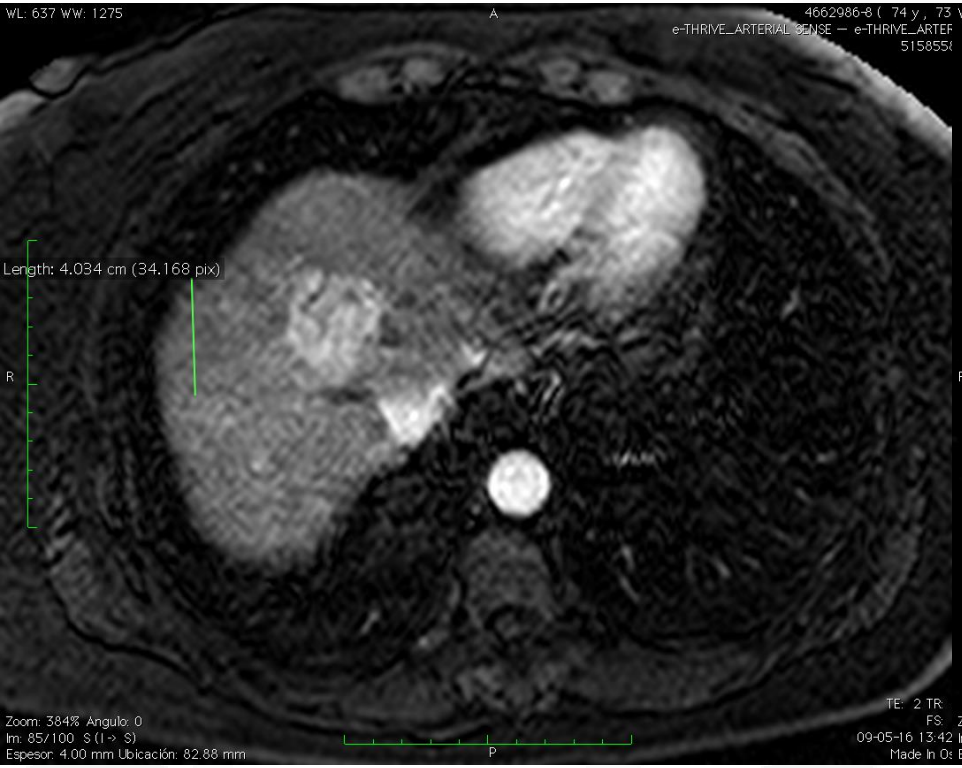
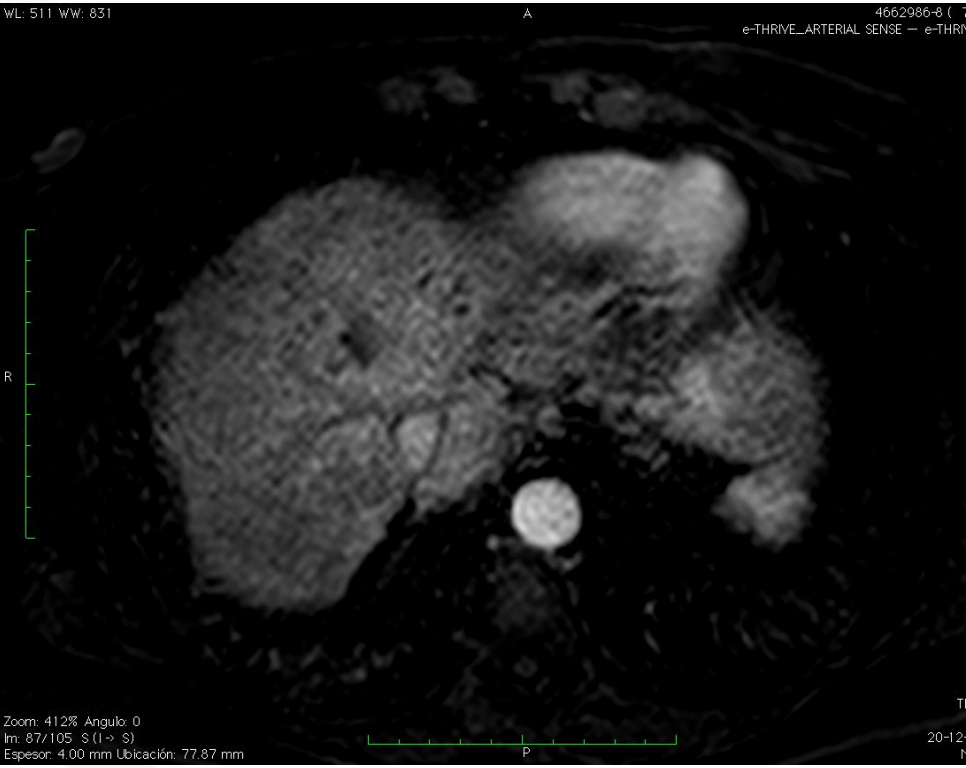
Mayo 2016




Septiembre 2016

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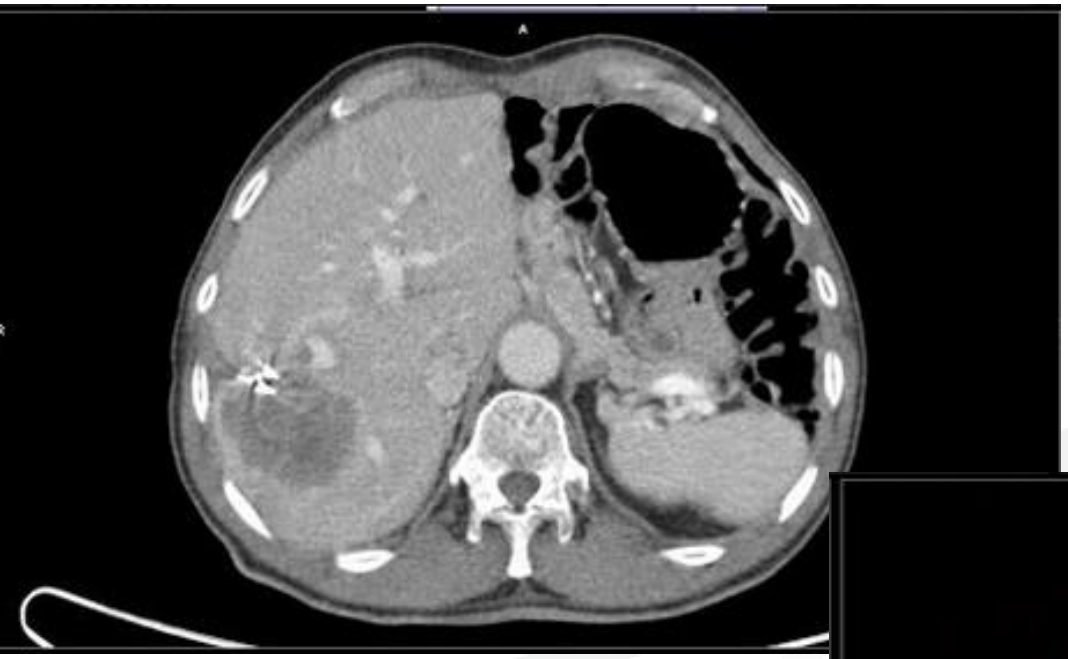
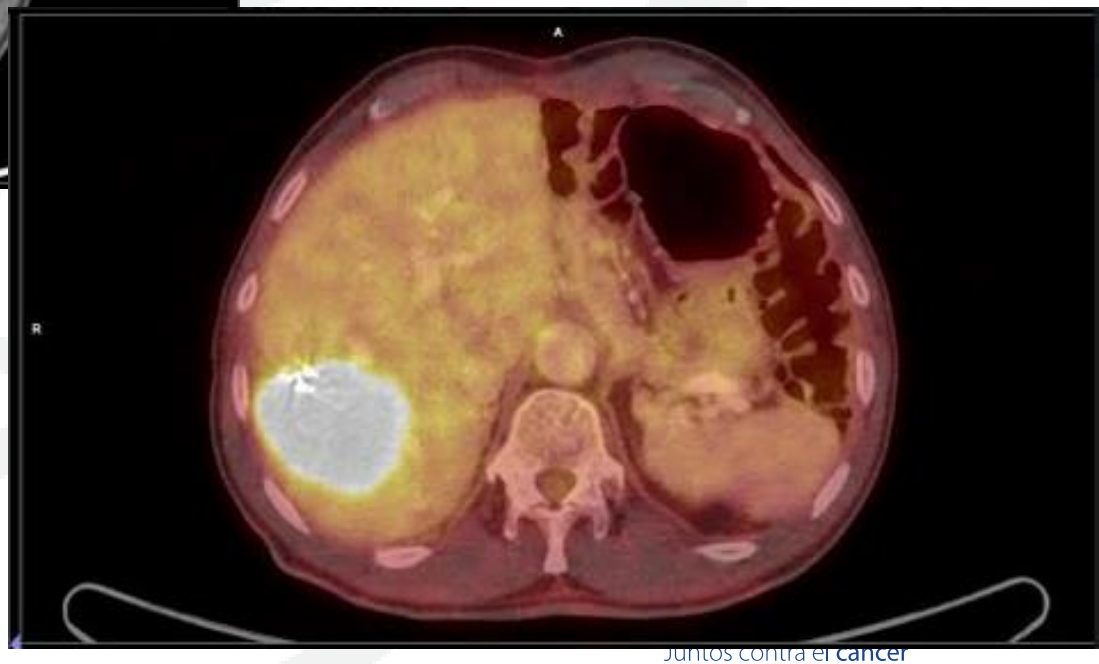
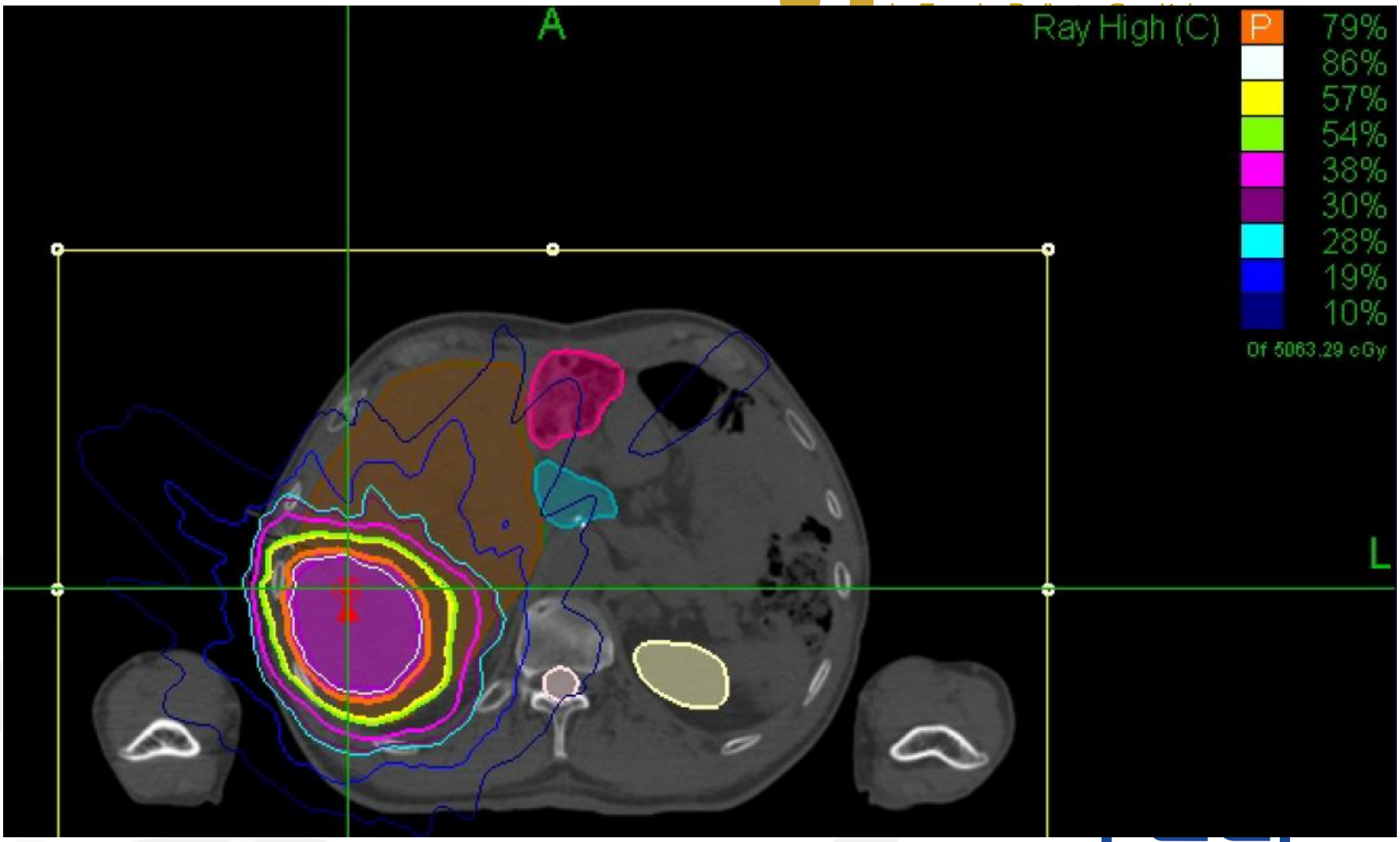
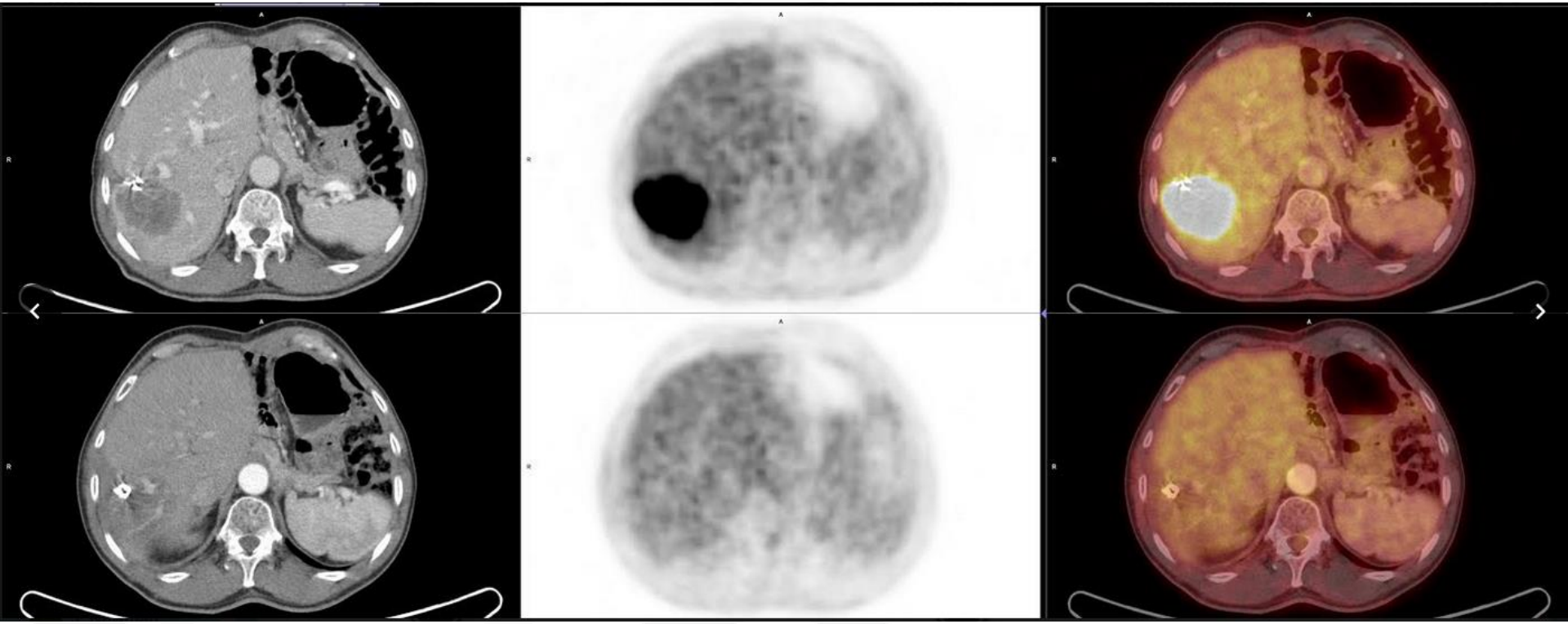
# Caso Clinico 2








A
Ray High (C)
P 79%
86%
57%
54%
38%
30%
28%
19%
10%
Of 5063.29 cGy
L



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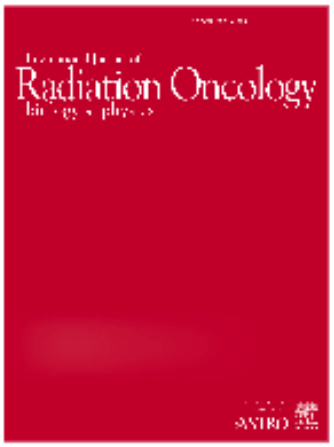


Long term outcomes of phase I and II studies of SBRT for hepatic colorectal metastases

Andrew McPartlin, MBChB, Anand Swaminath, MD, Ri Wang, Melania Pintilie, MSc, James Brierley, MD, John Kim, MD, Jolie Ringash, MSc MD, Rebecca Wong, MSc MBChB, Rob Dinniwell, MSc MD, Tim Craig, PhD, Laura A. Dawson, MD

PII: S0360-3016(17)30808-8

DOI: 10.1016/j.ijrobp.2017.04.010

Reference: ROB 24210

To appear in: *International Journal of Radiation Oncology • Biology • Physics*

Received Date: 17 December 2016

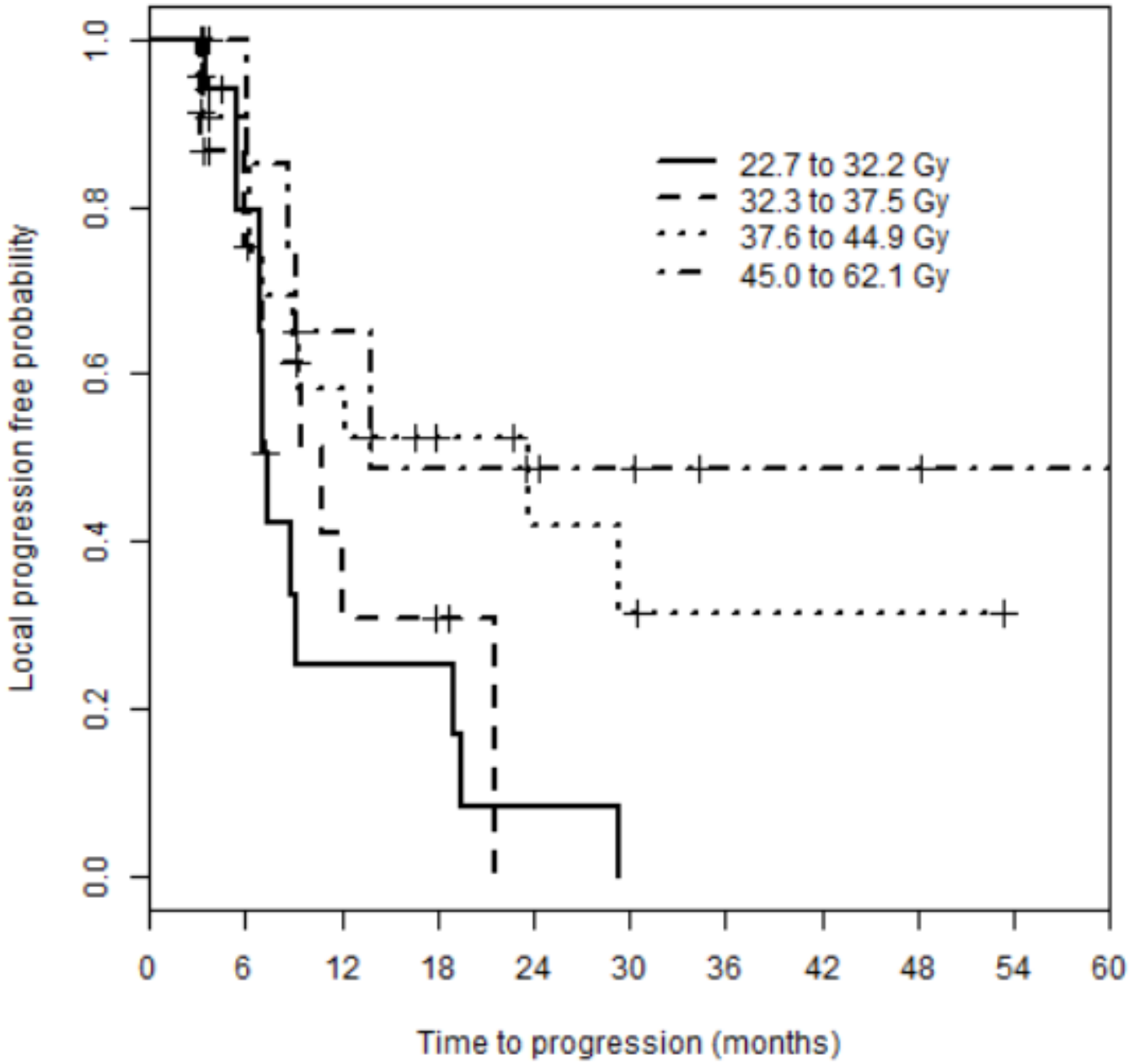
Local progression free probability
0.0
0.2
0.4
0.6
0.8
1.0
0
6
12
18
24
30
36
42
48
54
60
Time to progression (months)
22.7 to 32.2 Gy
32.3 to 37.5 Gy
37.6 to 44.9 Gy
45.0 to 62.1 Gy

**Table 18.1** Results from prospective and large retrospective studies of SBRT for liver metastases

| Author; year | Design | Pts with liver metastases | Frx × dose | m-FU mts | Local control 2-years (%) | Survival 1-, 2-years (%) |
|---|---|---|---|---|---|---|
| Schefter 2005 [19] | Phase I | 18 | 3 × 12–20 Gy | NR | NR | NR |
| Katz 2007 [20] | Retrospect | 69 | 5 × 10 Gy | 14.5 | 57 | 68, 24 |
| McCammon 2009 [21] | Retrospect | 81/141[a] | 3 × 12 Gy<br>3 × 16 Gy<br>3 × 20 Gy | 8.2 | 89<br>59<br>8 | NR |
| Rusthoven 2009 [23] | Phase I/II | 47 | 3 × 12–20 Gy | 16 | 92 | 77, 30 |
| Lee 2009 [24] | Phase I | 68 | 6 × 4.6–10 Gy | 11 | 71 (1-yr) | 79, 41 (3 yr) |
| Goodman 2010 [26] | Phase I | 19 | 1 × 18–30 Gy | 17 | 75 | 62, 49 |
| Rule 2010 [25] | Phase I | 27 | 3 × 10 Gy<br>5 × 10 Gy<br>5 × 12 Gy | 20 | 56<br>89<br>100 | 90, 50<br>78, 67<br>75, 56 |
| Van der Pool 2010 [22] | Retrospect | 20 | 3 × 10–12.5 Gy | 26 | 74 | 100, 74 |
| Chang 2011 [27] | Retrospect | 65 | 2–3 × 20 Gy | 55 | 38 (2–yr) | 77, 45 |
| Comito 2014 [28] | Phase II | 42 | 4 × 12 Gy –<br>3 × 25 Gy | 24 | 80 | 80, 65 |
| De Vin 2014 [29] | Retrospect | 77/309[a] | 10 × 4–5 Gy | 12 | 33 | 32 (3-yr) |
| Fode 2015 [6] | Retrospect | 225/321[a] | 3 × 15–22.5 | 29 | LR: 13 | 80, 58 |
| Scorsetti 2015 [30] | Phase II | 42 | 3 × 25 Gy | 24 | 91 | 81, 65 |
| Meyer 2016 [31] | Phase I | 14 | 1 × 35–40 Gy | 30 | 100 | 85, 78 |

*m-FU* median follow-up; *NR* not reported; *LR* local recurrence in competitive risk analysis
[a]Mixed patient material included other than liver metastasis patients
[b]Biochemical tests

# Conclusiones

- La radioterapia estereotáxica para carcinoma hepatocelular es altamente efectiva en control local de la enfermedad
- La toxicidad del tratamiento es baja para pacientes con función hepática Child A y algunos Child B7
- Las posibles toxicidades son severas, y se requiere contar con hepatologos, cirujanos hepatobiliares y posibilidad de hospitalizar pacientes en forma urgente
- Escalación de dosis puede tener un rol beneficioso en estos pacientes
- La SBRT puede ser utilizada como puente a trasplante

# Gracias

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