

Interventional Oncology

8-10 Maggio 2017

Bologna

Società Medica Chirurgica - Palazzo dell'Archiginnasio

Radiologia Interventistica nel trattamento delle metastasi da NET

Cinzia Mincarelli

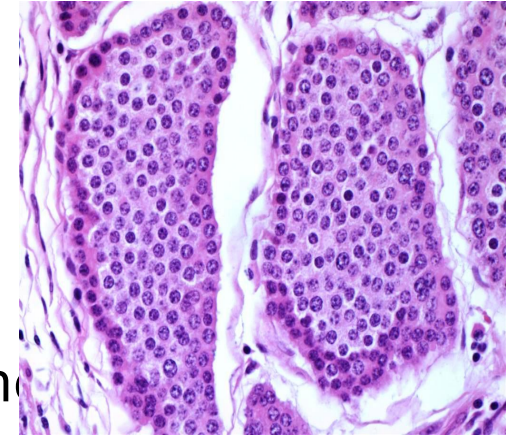
SOD Complessa Radiologia Interventistica

Direttore R.Candelari

Ospedali Riuniti di Ancona

Tumori neuroendocrini

- dalle cellule del sistema APUD:
 - tratto GI → cellule enterocromaffini
 - Pancreas → cellule insulari
 - polmoni → cellule di Kulchitsky e cellule bronchiali
- Secernenti/non secernenti
- Immunistochimica: Cromogranina +, Serotonina+, Sinaptofisina+, CD56 +



Incidenza 2/100.000 anno

USA register 1976-1991 (Modin et al. Cancer 1997)

Manifestazioni Cliniche

- Asintomatici
- Anemia
- Nausea e vomito
- Sindromi da ipersecrezioni ormonali (S. da Carcinoide)
- Complicanze da estensione locale (perforazione, occlusione, sanguinamento)
- **Metastasi a distanza (epatiche)**

EUROPEAN JOURNAL OF
RADIOLOGY

These tumors generally become symptomatic when they are associated with liver metastases, and 80-90% of these tumors are inoperable at the time of presentation. This is because the liver has to produce sufficiently large quantities of hormones in order for symptoms to appear...

Liver metastases of neuroendocrine carcinomas: Interventional treatment via transarterial embolization, chemoembolization and thermal ablation. T.J. Vogl et al. / European Journal of Radiology 72 (2009) 517–528 519

Metastasi epatiche da NET

- Inattive
- Attive
 - Sindrome da carcinoide
 - 4-10% nei carcinoidi primitivi senza meta
 - 60% nei carcinodi con meta

Razionale del trattamento:

- Controllo della sintomatologia (tumori attivi)
- Controllo dei sintomi correlati alle dimensioni e alla crescita tumorale
- Miglioramento sopravvivenza a 5 anni

The dark side of the guidelines

SAGE-Hindawi Access to Research
International Journal of Hepatology
Volume 2011, Article ID 452343, 12 pages
doi:10.4061/2011/452343

Review Article Multimodal Liver-Directed Management of Neuroendocrine Hepatic Metastases

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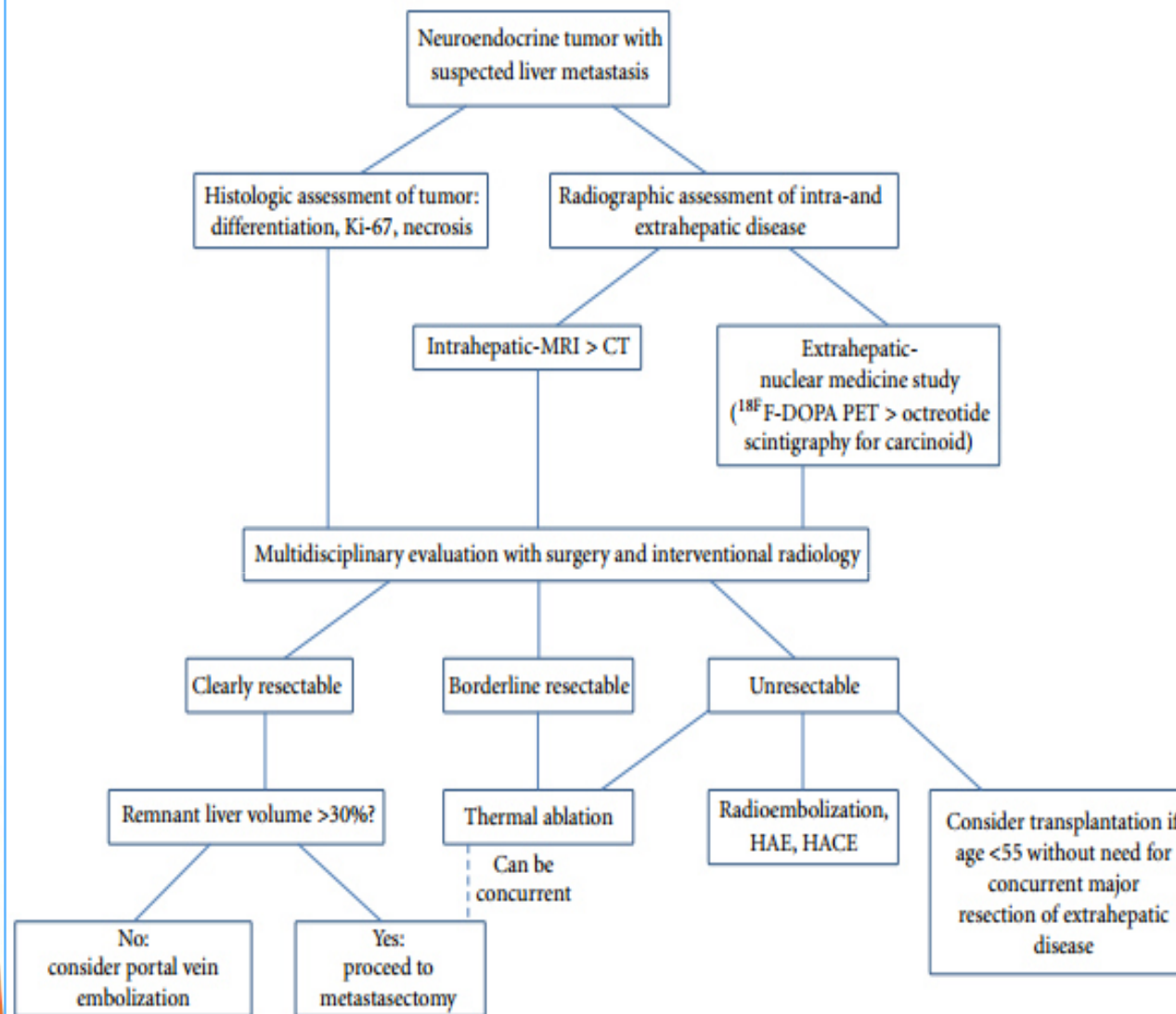


FIGURE 1: Liver-directed treatment algorithm for neuroendocrine hepatic metastases.



hepatologist

Review

T de Baere and others

Interventional radiology in
GEP-NET treatment

172:4

R151-R166

GEP-NETS UPDATE

Interventional radiology: role in the treatment of liver metastases from GEP-NETs

Thierry de Baere^{1,6}, Frederic Deschamps¹, Lambros Tselikas¹, Michel Ducreux^{2,6}, David Planchard², Ernesto Pearson¹, Amandine Berdelou³, Sophie Leboulleux³, Dominique Elias⁴ and Eric Baudin⁵

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Review

T de Baere and others

Interventional radiology in
GEP-NET treatment

172:4

R162

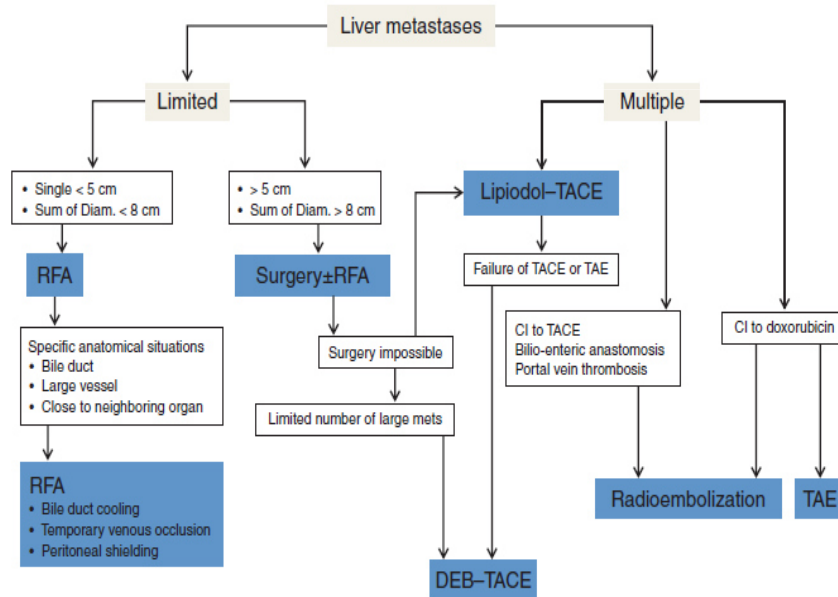


Figure 4 Gustave Roussy algorithm for liver-directed therapy making strategy. TACE, trans-arterial chemoembolization; TAE, trans-arterial embolization; DEBs, drug-eluting beads; RFA, radiofrequency ablation; Diam., diameters of all metastases; CI, contraindication.

Interventional Radiology
It's like surgery, only

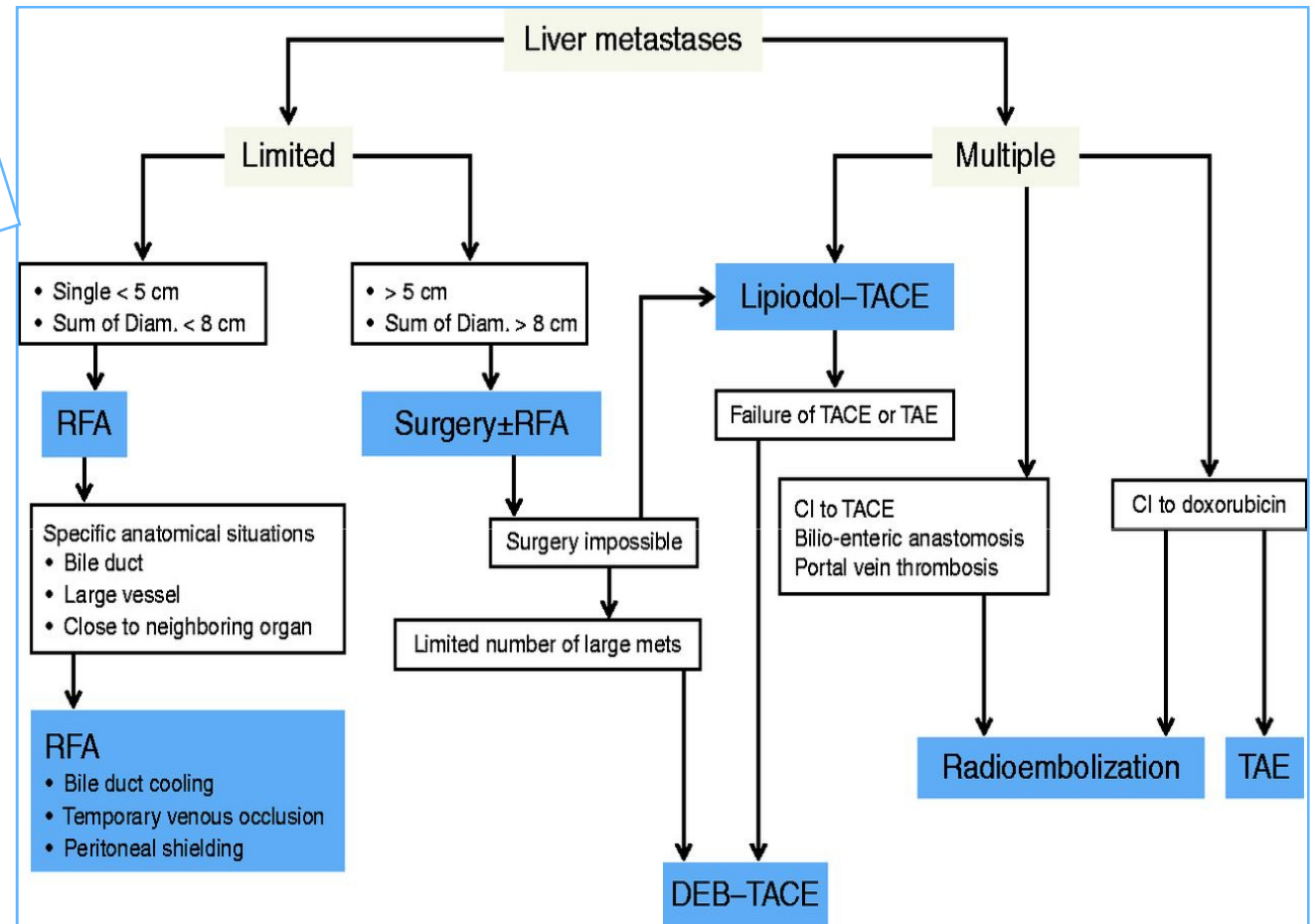


Tag Oncol (2012) 7:107–116
DOI 10.1007/s11523-012-0219-8
REVIEW

Liver-directed therapies in liver metastases from neuroendocrine tumors of the gastrointestinal tract

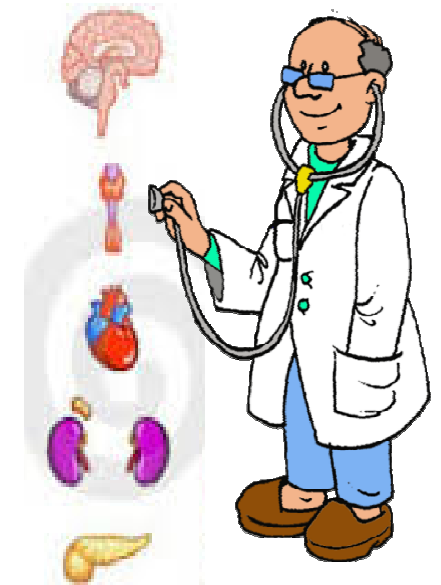
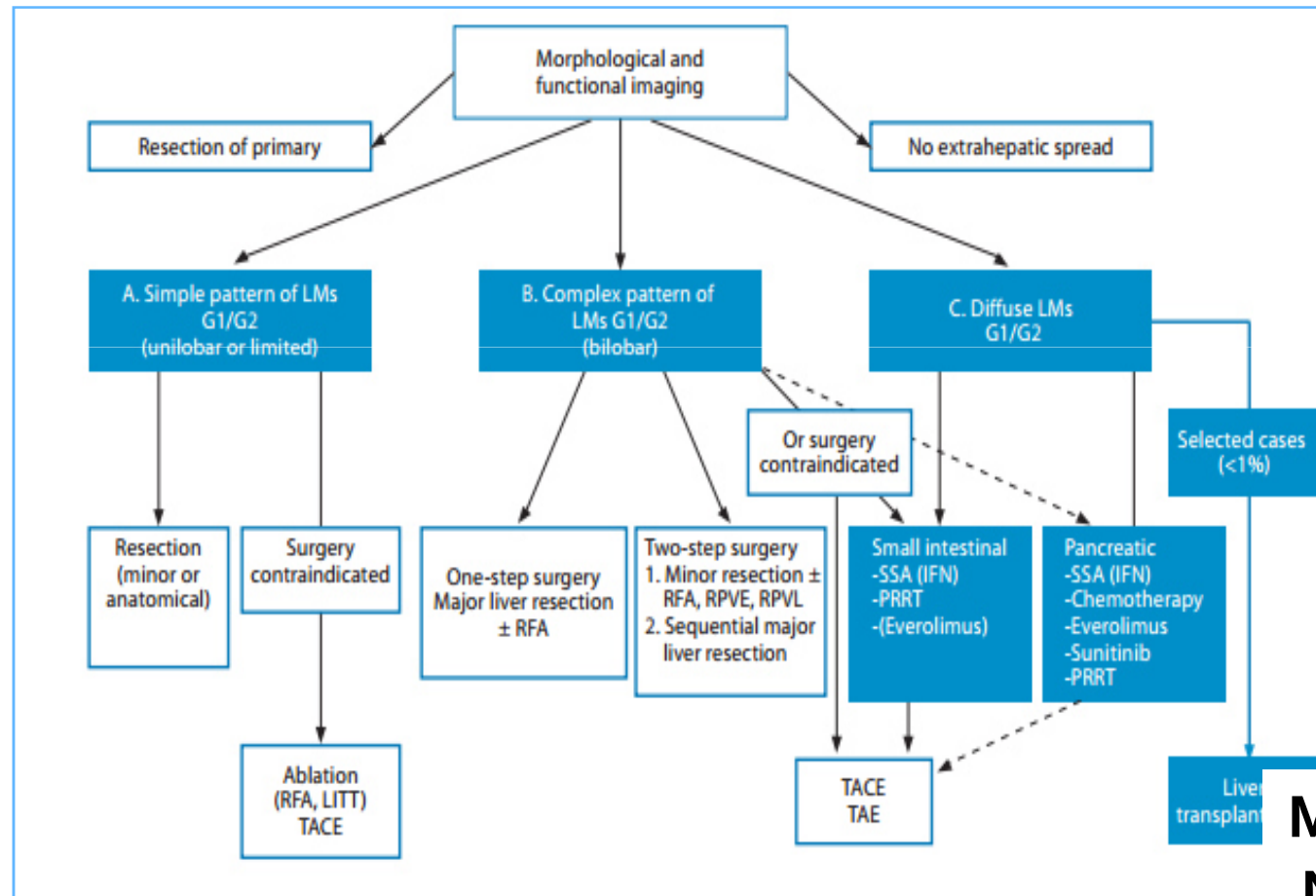
Magaly Zappa · Mohamed Abdel-Rehim ·
Olivia Hentic · Marie-Pierre Villierne ·
Philippe Ruszniewski · Valérie Vilgrain

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TACE, trans-arterial chemoembolization; TAE, trans-arterial embolization; DEBs, drug-eluting beads; RFA, radiofrequency ablation; Diam., diameters of all metastases; CI, contraindication

ENETS Consensus Guidelines for the Management of Patients with Liver and Other Distant Metastases from Neuroendocrine Neoplasms of Foregut, Midgut, Hindgut, and Unknown Primary



Marianne Pavel et Al.
Neuroendocrinology

Multimodal management of neuroendocrine liver metastases

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Table 1 The ENETS criteria for assessing the prognosis of non-functioning (neuro)endocrine pancreatic tumours^{52-54,239,240}

Biological behaviour	WHO classification	Metastases	Invasion	Histological differentiation	Tumour size (cm)	Angioinvasion	Ki-67 index (%)	Mitotic count (10 HPF)
Benign (low risk)	Group 1	–	–	Well differentiated	≤2	–	≤2	<2
Benign or low-grade malignant (intermediate risk)	Group 1	–	–	Well differentiated	>2	±	≤2	<2
Low-grade malignant	Group 2	+	+	Well differentiated	usually >3	+	3–20	2–20
High-grade malignant	Group 3	+	+	Poorly differentiated	any	+	>20	>20

10 HPF: high power field = 2 mm², at least 40 fields (at 40× magnification) evaluated in areas of highest mitotic density.

Ki-67 index determined with MIB1 antibody; % of 2000 tumour cells in areas of highest nuclear labelling.

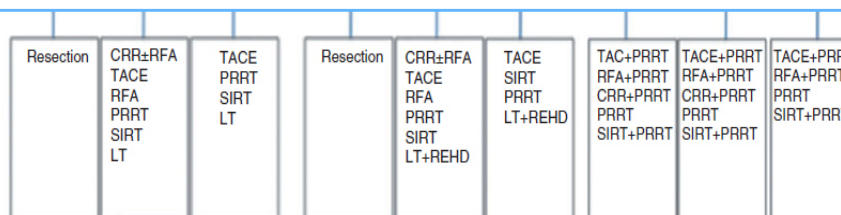
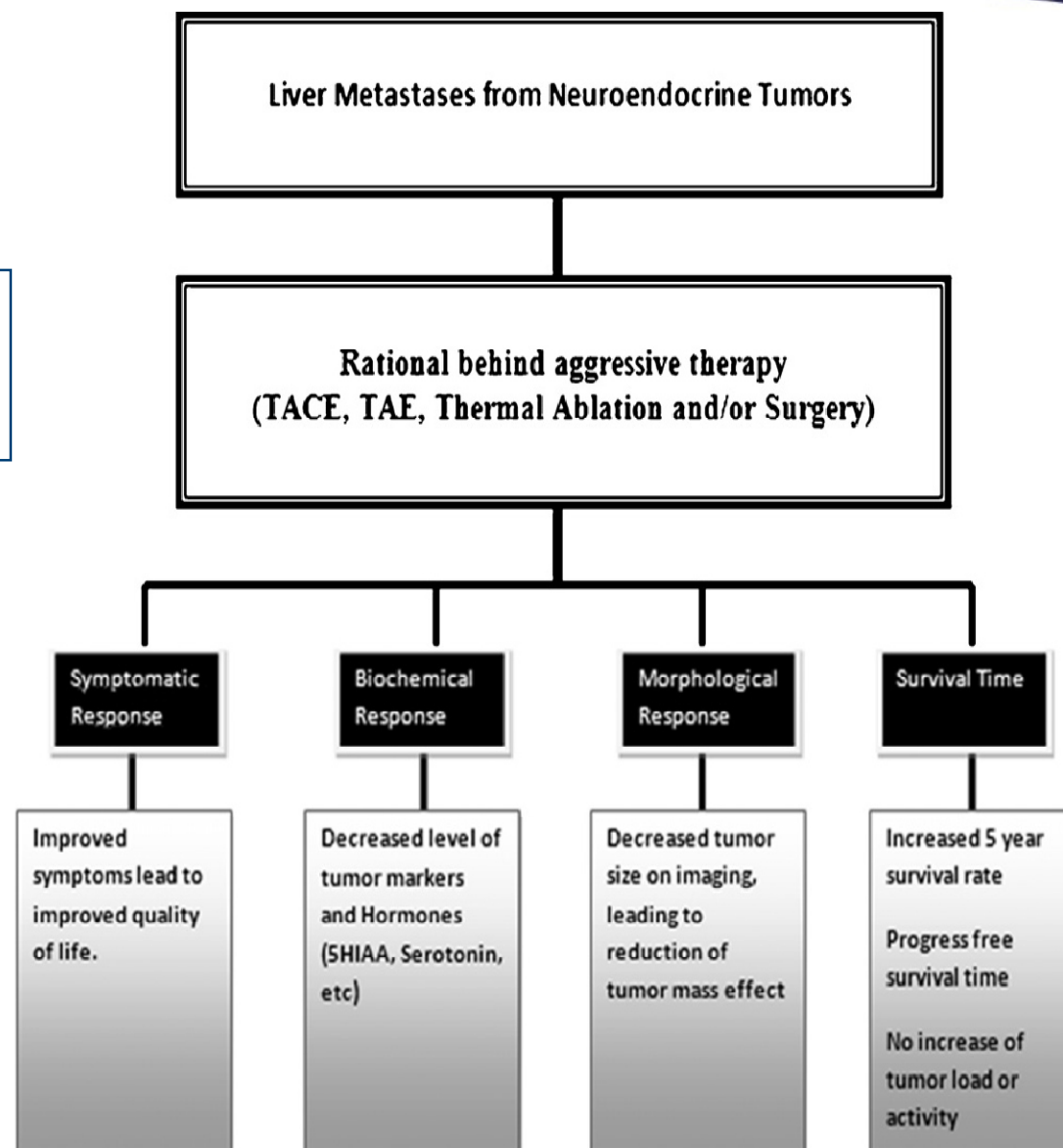


Figure 3 Evaluation and treatment decision for patients with well-differentiated neuroendocrine liver metastases⁴⁷.

LM, liver metastases; CRR, cytoreductive resection; RFA, radiofrequency ablation; LT, liver transplantation; TACE, transcatheter arterial chemoembolization; SIRT, selective internal radiotherapy; PRRT, peptide receptor radionuclide therapy; EHD, extrahepatic disease; REHD, resection of extrahepatic disease; US, ultrasound; FNB, fine needle biopsy

Thomas J. Vogl et Al.
European Journal of
Radiology 2009





Review

Liver metastases of neuroendocrine carcinomas: Interventional treatment via transarterial embolization, chemoembolization and thermal ablation

Thomas J. Vogl, Nagy N.N. Naguib, Stefan Zangos, Katrin Eichler, Alborz Hedayati, Nour-Eldin A. Nour-Eldin*

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The dark side of the guidelines

Survival rates of patients in terms of 5-year survival or months post-therapy noted in literature

Name	No. of patients	Treatment	Number	Time	Percentage
Carrasco et al.	25	TAE	15L/8D	16 months, 1–50 (Death)5 d to 22 months	
Brown et al.	35	TAE		5 yrs	54%
Eriksson et al.	29	TAE		5 yrs	40%
	12 pancreas	TAE		20 months, 5 yrs	0
Loewe et al.	23	TAE		5 yrs, 68 months	65.4%
Perry et al.	30	TACE		median 24 months	
Diacio et al.	10	TACE		40 months 12–65	
Therasse et al.	24	TACE		median 24 months	
Drougas et al.	15	TACE		16 median 1–77	
Kim et al.	30	TACE		15 median 2–67	
Stokes et al.	20	TACE	17	6–2 months	
Fiorentini et al.	10	TACE		mean 22 months	
Clouse et al.	20	TACE		24 months	
Roche et al.	14	TACE		10 yrs, 5 yrs	56%, 83%
Kress et al.	26	TACE		5 yrs	48%
Que et al.	74	Surgery		4 yrs	73%
Hanssen et al.	36	Alpha interferon		5 yrs	40%
		With HAE		5 yrs	75%
Chamberlain et al.	85	Non aggressive medical therapy		1/3/5 yrs	76/39/na
	33	Surgery		1/3/5 yrs	94%, 83%, 76%
	34	TAE		1/3/5 yrs	94%, 83%, 50%
Touzios et al.	23	Non aggressive		20 months, 5 yrs	25%
	19	Sx ± RFA		96 months, 5 yr	72%
	18	TACE ± abl, sx		50 months, 5 yrs	50%
Gupta et al.	69 carcinoid tumors	TAE/TACE		Median 33.8 months	95.3%, 68.6%, 28.6%
	54 islet cell tumor	TAE/TACE		Median 23.2 months	68.8%, 48.7%, 13.7%

Armi a disposizione

- Chirurgia
- Analoghi somatostatina ed interferone
- CHT sistemica
- TAE-TACE
- TARE
- Termoablazione
- Crioablazione
- Alcolizzazione



Chirurgia

- Resezione epatica: Gold Standard
- 10-20% dei Pz con malattia resecabile
- Caso ideale: coinvolgimento di un singolo lobo (< 3-5 lesioni)
- Trapianto (sdr da carcinoide, insuccesso delle altre tp) → ultima linea di trattamento (Criteri di Milano)
- Maggior frequenza di complicanze

half of NET patients will have more than 50% of their liver replaced at the time metastases are first recognized, but the percentage of involvement of the hepatic parenchyma by tumor does not necessarily affect surgical outcome

Mark A. Lewis and Joleen Hubbard, Multimodal Liver-Directed Management of Neuroendocrine Hepatic Metastases, International Journal of Hepatology 2011

Analoghi somatostatina ed interferone

- Miglioramento della sintomatologia nei Pz con sdr da carcinoidi
- Alpha interferon (3–9 milioni di unità sottocute 3-7/sett): risposta biochimica del 50% e riduzione volumetrica del tumore nel 15% dei Pz fino a 3 aa
- Octreotide (100-300 g/gg): riduzione dei sintomi nel 60% dei Pz e risposta biochimica in più del 70% dei Pz con VIP o tumori produttori glucagone; risposta del tumore in meno del 5%
- Col tempo i tumori diventano refrattari a queste terapie
- Maggior efficace in Pz con sdr da carcinoidi

Chemioterapia sistemica

- Efficace nei NET con alta attività proliferativa (NET pancreatici e carcinoidi polmonari)
 - Streptozotocin-based combinations including 5-flourouracil and doxorubicin: Remissione parziale nel 40% dei Pz (sopravvivenza media 2 aa)
- Meno efficace nei NET con bassa attività proliferativa
 - Risposta nel 10% dei Pz

Termoablazione

RFA-MWA

Trattamento percutaneo sotto guida US o TC o durante l'atto chirurgico (laparotomia o laparoscopia)

- ✓ malattia oligonodulare < 5 lesioni
- ✓ Dimensioni < 5 cm
- ✓ Lesioni inoperabili
- ✓ Completamento di resezione chirurgica

Fattori predittivi di recidiva: dimensioni, margini dell'ablazione e rapporti con i

new tumors are reported up to 63 % in the largest series of patients treated with RFA...
...conversely, local liver recurrence was observed from 3.3 % to 7.9 % perlesion

Akyildiz et Al. 2010

RFA, either percutaneous or during surgery, has been associated with an SR of 71–95% for a mean duration of 8–10 months, a BR of 65%, and a mean SP of 1.6 years after ablation

Vogl et Al. 2015

Radiofrequenza

Interestingly, in a meta analysis including 5.224 ablated tumors of various origin, the rate of local recurrence was lower in neuroendocrine LM than

in others

Mulier S, Ni Y, Jamart J, Ruers T, Marchal G, Michel L (2005)
Local recurrence after hepatic radiofrequency coagulation: multivariate meta-analysis and review of contributing factors. Ann Surg 242(2):158–171
15. Berber E, Siperstein

Microwave ablation

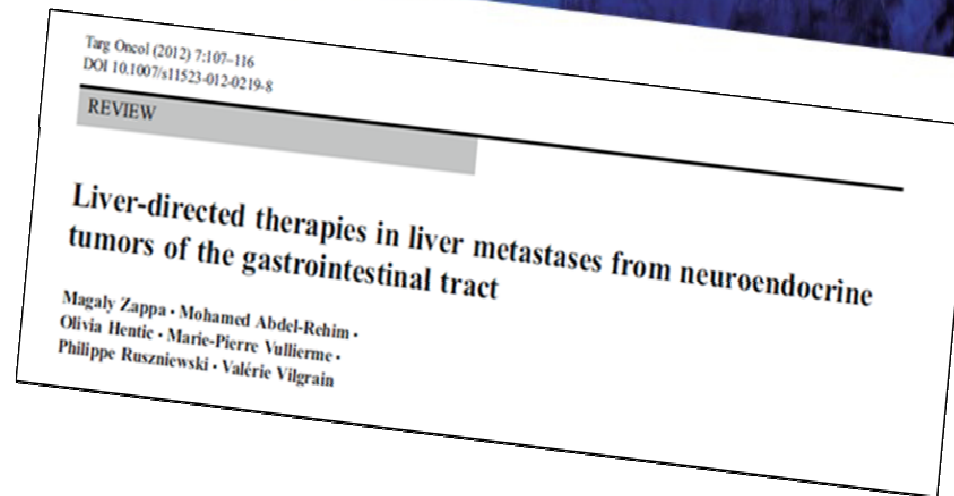


The principle of this technique is similar to RFA
but has several theoretical advantages.

Intratumoral temperatures are consistently higher than can be
achieved with RFA

Overcoming the “heat sink” effect observed in RFA due to the cooling
effect of blood flow in large vessels close to the tumor, both resulting
in a better tumor control

Crioterapia



To our knowledge, only three series have evaluated cryotherapy in LM
from NETs

(the largest with 19 patients)

As with other thermal ablative techniques, hormonal symptoms relief was
observed in the vast majority of patients

Notably, postprocedural coagulopathy has been found in all patients of the
two main series requiring transfusion of either platelets or fresh frozen
plasma

Terapia trans-arteriosa (Razionale)

Rifornimento ematico parenchima epatico

75% v. porta

25% a. epatica



NET

Meta epatiche
ipervascolari

Rifornimento ematico
dall'a. epatica (>90%)

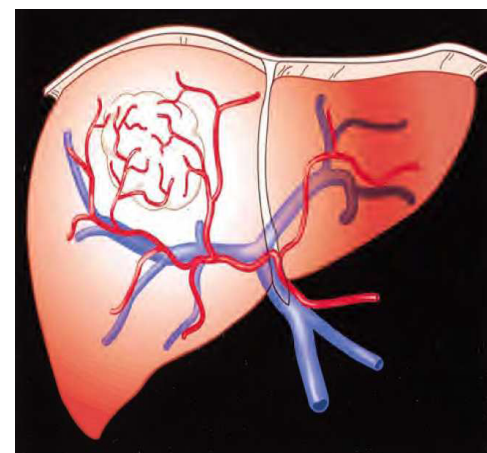


Table 1 Results of TACE or TAE studies performed in patients with LM from NET

Author	Yr	Patients/ Session	Tumor	Treatment	Methods	PR	SD	PD	TTP	OS	% symptom relief	% bioch resp
Carnasco [32]	86	25/79	16 SB 9 other	TAE	Sponge	94			11	16	87	100
Ajani [57]	88	22/97	GP	TAE	PVA	60				34	60	60
Ruszniewski [50]	93	23/71	18 SB 5 GP	TACE	Doxo + sponge	61	22	17	14		73	57
Therasse [31]	93	28	SB	TACE	Doxo + sponge	35	24		29	24	100	91
Diamandidou [58]	98	20/60	17 SB 3 GP	TACE	Microencapsulate cisplatin	78	22				67	73
Eriksson [35]	98	41/55	29SB 12 GP	TAE	Sponge	38	43	19	12	80	52	38
Brown [48]	99	35/63	21 SB 14 GP	TAE	PVA				15	21	89	42
Kim [34]	99	30	16 SB 14 GP	TACE	Cispl + doxo 5FU + STZ	25			24	15		75
Dominguez [29]	00	15/45	8 SB 7 GP	TACE	STZ	53			11		60	90
Gupta [59]	03	81	SB	TAE 50 TACE 31	PVA or sponge No precision	75	16	9	19	31	63	50
Kress [33]	03	26/62	12 SB 10 GP 4 UK	TACE	No precision	8	53	19				
Loewe [60]	03	33/75	SB	TAE	Cyanoacrylate	73	23	4			56	62
Roche [47]	03	14	SB	TACE	Doxo + sponge	72	14	14		47	90	75
Roche [46]	04	64/186		TACE	Doxo + sponge	74			15		93	52
Gupta [39]	05	123	69 SB 54 GP	42TAE + 27TACE 32TAE + 22TACE	PVA or sponge No precision	67			23	34		
Osborne [61]	06	59	42 SB 17 GP	TAE	PVA or embospheres	35			16	23		
Strosberg [41]	06	84	59 SB 20 GP 5 other	TAE	PVA or embospheres	48	52	0		36	80	91
Bloomston [62]	07	122	SB	TACE	Doxo + mito + cispl Sp, PVA or emb	82	12		19	33	92	80
Granberg [30]	07	15/23	7 SB 8 other	TAE	Embospheres	35	56	9	6		42	13
Ho [40]	07	46/93	31 SB 15 GP	TAE 7 TACE 86	Sponge ou PVA Doxo + mito + cispl	45	32	23	42	42	78	
Marrache [11]	07	67/163	48 SB 19 GP	TACE	STZ(44) ou doxo(23)	37	36	27	15		91	65
Rutaiainen [38]	07	67/219		TAE 23 TACE 44	PVA Doxo + mito + cispl				15		7	
De Baere [43]	08	20/34		TACE	Deb Doxo	80	15	5	15			
Kamat [63]	08	38	7 SB 10 GP 21 other	TAE ou TACE	PVA or sponge TACE various	44			9	19	65	
Pitt [36]	08	100	56 SB 44 GP	TAE 49 TACE 51	Sp, PVA, emb Cispladria, mito				56	26	TAE 76 TACE 69	
Sward [64]	09	107/213	SB	TAE	Sponge or PVA						71	60

The dark side of the guidelines

Embolization vs chemoembolization

Several studies have retrospectively compared TAE and TACE in patients with LM from NETs. In all studies, but one, treated patients had NET from the jejunum/ileum and NET from pancreatic origin and no subgroup analysis has been performed. In two studies, no differences have been shown in terms of patient survival and tumor response [36, 37]. In one study, chemoembolization demonstrated trends toward improvement, in time to progression, symptom control and survival (although not significant) [38]. Furthermore these authors, as others have shown that chemoembolization was not associated with a higher degree of toxicity than bland embolization [38].

DOI 10.1007/s11523-012-0219-8

REVIEW

Liver-directed therapies in liver metastases from neuroendocrine tumors of the gastrointestinal tract

Magaly Zappa • Mohamed Abdel-Rehim •
Olivia Hentic • Marie-Pierre Vullierme •
Philippe Ruszniewski • Valérie Vilgrain

Potential advantage in using streptozotocin, especially in LM from the pancreas, which may save doxorubicin for subsequent use and chemotherapy



Best morphological responses are obtained in patients with limited liver involvement (<30 % or <50 %)
On the other hand, toxicity is increased in major liver involvement (>70 % or 75 %)

Primary tumor of the jejunum/ileum is associated with a better tumor response

TACE or TAE?

Carcinoid (n=69)

- No difference in response rate/survival

Islet cell carcinoma (n=54)

- Response rate TACE 50% vs TAE 25%
- Prolonged survival → TACE 31 vs TAE 18 Months

Gupta et al; Cancer 2005

Carcinoid (n=67) → TACE (44) vs TAE (23)

- PFS 2 & 3 years: 65% & 52% TACE vs 0% & 0% TAE
- Progression 12 months (TACE 0% vs TAE 49%)
- Mean duration of symptom relief (TACE 15 vs TAE 12 months)
- Survival (TACE 76% vs TAE 68% at 2 years)

Ruutilainen et al; JVIR 2007

DEB-TACE or Lipiodol-TACE?

Response rate

DEB-TACE

PR 43% SD 39% → 82% tumor control (Gaur SK; CVIR 2011)

PR 80% SD 15% → 95% tumor control (De Baere T; JVIR 2008)

Lipiodol-TACE

PR 41% MR 33% SD 15% → 89% tumor control (A Roche & de Baere T; Hepatogastrenterol 2004)

PR 67% MR 8,7% SD 16% → 91,7% tumor control (Grupta et al; Cancer 2005)

Evaluation by WHO, no 3D rotational, few microcatheter

DEB-TACE or Lipiodol-TACE?

DEB-TACE

Median time to progression: 15 months
(*De Baere T; JVIR 2008*)

Median time to progression: 14 months
(*Gaur SK; CVIR 2011*)

Lipiodol-TACE

Median TTP: 18 months
(*A Roche & De Beare T; hepatogastreterol 2004*)

Median TTP: 22,7 months for carcinoid, 16,1 months for islet cell
(*Grupta et al; Cancer 2005*)

DEB-TACE or Lipiodol-TACE? complications

The dark side of the guidelines

278 TACE			
NET group		HCC group	
Lipiodol TACE	DEB TACE	Lipiodol TACE	DEB TACE
152	126	142	56

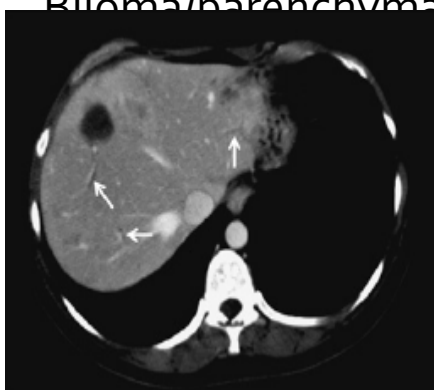
Research Article

EASL EUROPEAN ASSOCIATION FOR THE STUDY OF THE LIVER | JOURNAL OF HEPATOLOGY

Liver/biliary injuries following chemoembolisation of endocrine tumours and hepatocellular carcinoma: Lipiodol vs. drug-eluting beads

Boris Guiu^{1,2,*}, Frédéric Deschamps¹, Serge Aho³, Flore Munck¹, Clarisse Dromain⁴, Valérie Boige⁵, David Malka⁵, Sophie Leboulleux⁸, Michel Ducreux⁵, Martin Schlumberger⁷, Eric Baudin⁶, Thierry de Baere¹

- liver/biliary injury was associated with DEB-TACE (OR = 6.63; p < 0.001) irrespectively of the tumour type
- Biloma/parenchymal infarct was strongly associated with both DEB-TACE (OR = 0.78; p = 0.002)



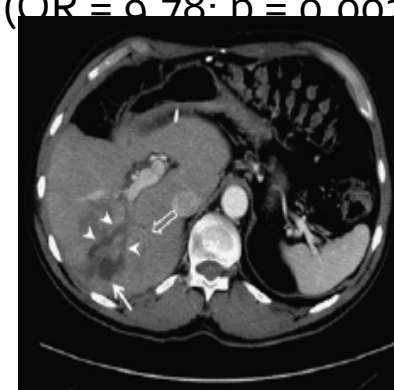
Bile ducts dilatation



Portal vein narrowing and liver infarct



Biloma/liver infarct



Portal vein thromboses
Biloma/liver infarct

Conventional versus Drug-Eluting Bead Transarterial Chemoembolization for Neuroendocrine Tumor Liver Metastases

78 TACE con ethiodized oil–based cisplatin, mitomycinC, e doxorubicina

99 **Table 3 . Clinical Outcomes as Characterized by Symptomatic, Biochemical, and Radiologic Response to Conventional Transarterial Chemoembolization and DEB Transarterial Chemoembolization Treatments**

Clinical Outcomes	Conventional Transarterial Chemoembolization	DEB Transarterial Chemoembolization	P
Symptomatic response			< .0001
Complete	5 (6.41%)	15 (15.2%)	
Partial	32 (41.0%)	15 (15.2%)	
Stable	34 (43.6%)	68 (68.7%)	
Progressive	7 (9.0%)	1 (1.0%)	
Biochemical response			.60
Complete	6 (8.0%)	7 (7.9%)	
Partial	35 (46.7%)	43 (48.3%)	
Stable	14 (18.7%)	14 (15.7%)	
Progressive	20 (26.7%)	25 (28.1%)	
Radiologic response			.20
Complete	5 (6.9%)	7 (7.5%)	
Partial	55 (75.3%)	63 (67.0%)	
Stable	13 (17.8%)	17 (18.1%)	
Progressive	0 (0%)	7 (7.5%)	
Need for additional transarterial chemoembolization	39 (50.0%)	46 (46.5%)	.22

Conclusions: Conventional transarterial chemoembolization yields better symptomatic response and may be preferred for patients experiencing carcinoid symptoms. DEB transarterial chemoembolization, with lower LFT elevations and postembolization syndrome incidence, may be preferred for patients with poor liver function.

Initial Treatment of Unresectable Neuroendocrine Tumor Liver Metastases with Transarterial Chemoembolization using Streptozotocin: A 20-Year Experience

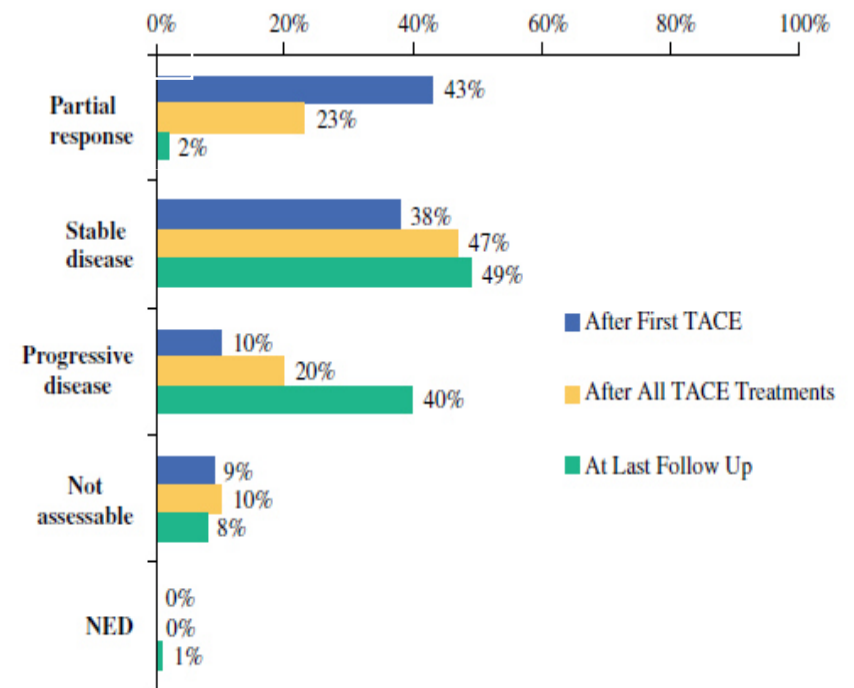
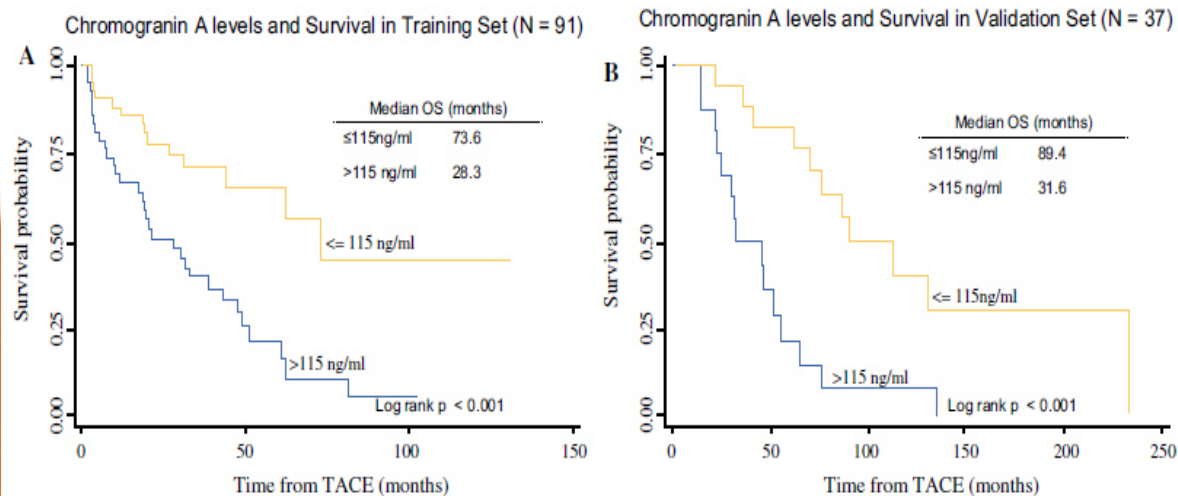
Mashaal Dhir, MBBS¹, Ruchi Shrestha, MD², Jennifer L. Steel, PhD¹, J. Wallis Marsh, MD, MBA¹, Allan Tsung, MD¹, Mitchel E. Tublin, MD², Nikhil B. Amesur, MD¹, Philip D. Orons, DO¹, Ernesto Santos, MD¹, and David A. Geller, MD¹

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The dark side of the guidelines

TACE with STZ is well tolerated with minimal toxicity and can lead to diminished carcinoid syndrome and long-term survival

474 TACE con STZ



CLINICAL INVESTIGATION

Chemoembolization of Neuroendocrine Liver Metastases Using Streptozocin and Tris-acryl Microspheres: Embozar (EMBOsphere + ZAnosaR) Study

Jean-Pierre Pelage^{1,2} · Audrey Fohlen^{1,2} · Emmanuel Mitry³ · Christine Lagrange⁴ · Alain Beauchet⁵ · Philippe Rougier³

25 Pz trattati con TACE:

1,5 g Streptozocina
10 ml Lipiodol
300-500 µm microsfere

Effective and well tolerated

	After first TACE (mean 3.4 months) n (%)	Mid-term response (mean 7.8 months) n (%)	Overall results (median 36.1 months) n (%)
Complete response	0 (0%)	1 (4%)	1 (4%)
Partial response	10 (40%)	15 (60%)	12 (48%)
Stable disease	14 (56%)	9 (36%)	7 (28%)
Non-progressive disease	24 (96%)	25 (100%)	20 (80%)
Progressive disease	1 (4%)	0 (0%)	5 (20%)

List of side effects	n (%)
Post-embolization syndrome	17 (68%)
Pain	14 (56%)
Vomiting	11 (44%)
Malaise	9 (36%)
Fever	4 (16%)
Liver function (at day 1)	Mean ± SD (range)
SGOT	343.8 ± 264.8 (83–840) IU/L
SGPT	344.8 ± 251.3 (46–878) IU/L
Bilirubin	18.8 ± 10.7 (9–42)

Standards of Practice in Transarterial Radioembolization

Andreas H. Mahnken · Carlo Spreafico ·
Geert Maleux · Thomas Helmberger ·
Tobias F. Jakobs

Biliary obstructions need to be corrected. However, any impairment of the ampulla predisposes the patient to ascending infection. In these patients, preinterventional antibiotic therapy (e.g., ciprofloxacin, cotrimoxazole), ideally starting the day before the procedure, is strongly recommended, and long-term antibiotic treatment needs to

Contraindications

There are only a few absolute contraindications for RE, including insufficient functional liver reserve (commonly used thresholds are total bilirubin >2.0 mg/dL and albumin <3 g/dL), severe lung shunting resulting in a lung dose of ≥ 30 Gy or anticipated nontarget embolization to the gastrointestinal tract that cannot be resolved by embolization techniques [13], and treatment with capecitabine within 2 months before RE with resin spheres.

Beside the typical relative contraindications for vascular procedures, such as uncorrectable coagulopathy, PVT is considered a relative contraindication with resin spheres, while the use of glass spheres is not limited by PVT. Initial results indicate that this technique is safe for treating HCC [14].

Predictors of response to radio-embolization (TheraSphere®) treatment of neuroendocrine liver metastasis

Mohammed Shaheen¹, Mazen Hassanain^{1,5}, Murad Aljiffry^{1,6}, Tatiana Cabrera², Prosanto Chaudhury¹, Eve Simoneau¹, Nuttawut Kongkaewpaisarn¹, Ayat Salman¹, Juan Rivera³, Mohammad Jamal¹, Robert Lisbona⁴, Azzam Khankan², David Valenti² & Peter Metrakos^{1,5}

The dark side of the guidelines

From January 2006 until March 2009
25 patients

TheraSphere®: 90Y-embedded glass microspheres that are pure b-emitters (high energy) with a half-life of 64.2 h.

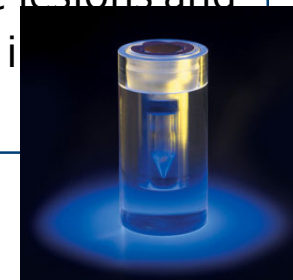
The emitted radiation exhibits a mean tissue penetration of 2.5 mm and a maximum of 11 mm

Predictors of response:

- Better response to 90Y radio-embolization treatment in patients with less bulky NET liver metastasis
 - 66,7% vs 31,5% in Patients who had prior surgical treatment
 - Tumor involving >66% of the liver → response rate 40% vs tumor involving <66% → response 53,1%
 - Bilobar disease → lower response (39,4%) vs unilobar disease (64,4%)
- the tumour burden (measured by percentage of liver involvement, the diameter of the lesions and the number of lesions in both liver lobes) was inversely related to the amount of tumour necrosis in the treated liver



Surgical treatment (resection or RFA) before radioembolization would allow 90Y treatment to achieve higher rates of response.



CLINICAL INVESTIGATION

Embolotherapy for Neuroendocrine Tumor Liver Metastases: Prognostic Factors for Hepatic Progression-Free Survival and Overall Survival

James X. Chen¹ · Steven Rose² · Sarah B. White³ · Ghassan El-Haddad⁴ ·
Nicholas Fidelman⁵ · Hooman Yarmohammadi⁶ · Winifred Hwang⁷ ·
Daniel Y. Sze⁷ · Nishita Kothary⁷ · Kristen Stashek⁸ · E. Paul Wileyto⁹ ·
Riad Salem¹⁰ · David C. Metz¹¹ · Michael C. Soulen¹

Study aim: evaluate disease and treatment related factors for impact on hepatic progression-free survival (PFS) and overall survival (OS) following embolotherapy for liver

155 patients
cTace (50), TARE (64), TAE (41)

Variables:

Patient factors: age gender, ECOG score

Tumor factors: WHO 2010 grade, tumor burden (<50 and >50% liver volume involvement), primary site, extrahepatic metastases

Treatment factors: systemic therapy, embolotherapy modality

CIRSE 2016

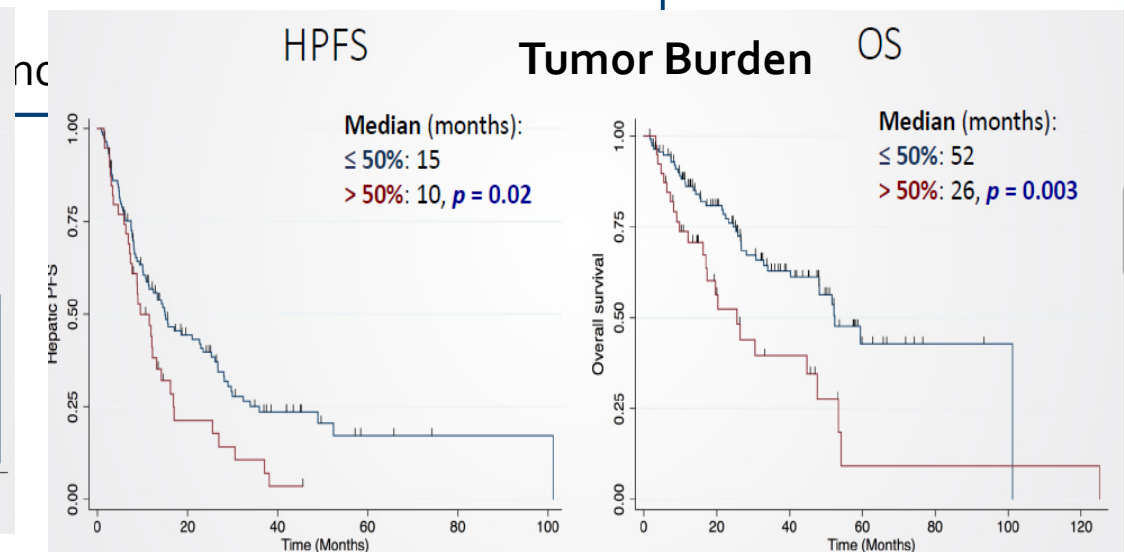
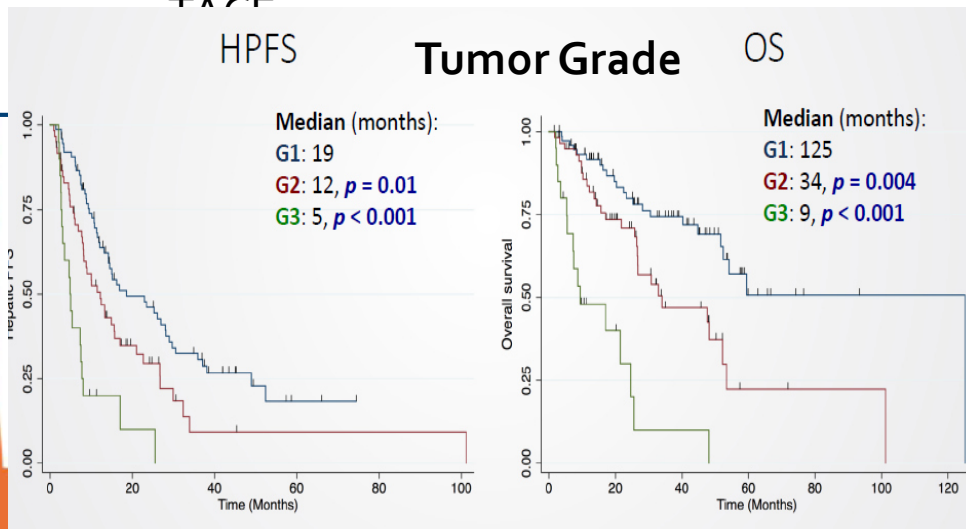
Embolotherapy for Neuroendocrine Tumor Liver Metastases: Prognostic Factors for Hepatic Progression-Free Survival and Overall Survival

The dark side of the guidelines

Prognostic factors:

- Patient factors:
 - ✓ ECOG score ≥ 1 : significantly shortened OS
- Tumor factors:
 - ✓ Higher WHO 2010 grade & tumor burden > 50%: significantly shortened HPFS & OS
 - ✓ primary site: no significant differences in HPFS & OS between pancreas, gut, lung
- Treatment factors: embolotherapy modality
 - ✓ OS: trend toward shorter OS for TARE vs TACE, equivalent OS for TAE vs TACE

No significant difference in severe adverse events between modalities



Radiofrequency ablation after selective internal radiation therapy with Yttrium90 microspheres in metastatic liver disease—Is it feasible?

R.T. Hoffmann^{a,*}, T.F. Jakobs^a, C.H. Kubisch^c, H.J. Stemmler^d, C. Trumm^a, K. Tatsch^e,

46 Patients with extensive hepatic metastatic disease (breast, CRC, NET, melanoma, thyroid, sarcoma)

No change situation or even progression after TACE

Radioembolization treatment using Yttrium90 resin (SIR-Spheres) microspheres with a mean activity of 2.13 GBq
no severe side-effects

In 5 patients tumor load decreased substantially making RFA feasible → complete ablation

The combination of SIRT and RFA can extend the number of patients with a “complete response” after a combination of minimally invasive therapies comparable to the so called “rescue surgery” after chemotherapy showing a significant increase of patients survival During follow-up after SIRT, the possibility of local ablative therapy should always be taken into account for an individual, best tailored patient care.

Cardiovasc Intervent Radiol. 2014 Apr;37(2):493-7. doi: 10.1007/s00270-013-0691-2. Epub 2013 Jul 10.

Repeated bland-TAE using small microspheres injected via an implantable port-catheter system for liver metastases: an initial experience.

Tanaka T¹, Nishiofuku H, Maeda S, Masada T, Anai H, Sakauchi H, Kichikawa K.



CardioVascular and Interventional Radiology

September 2016, Volume 39, Issue 9, pp 1315–1321

18F-FDOPA PET/CT-Guided Radiofrequency Ablation of Liver Metastases from Neuroendocrine Tumours: Technical Note on a Preliminary Experience

Usual and Unusual Neuroendocrine Tumor Metastases on 68Ga-DOTANOC PET/CT: A Pictorial Review

Naswa, Niraj MD; Sharma, Punit MD; Kumar, Rakesh DNB, PhD; Malhotra, Arun DRM, PhD; Bal, Chandrasekhar MD, DSc (HC)

Clinical Nuclear Medicine: June 2013 - Volume 38 - Issue 6 - p e239–e245
doi: 10.1097/RLU.0b013e318252d2c3
Atlas Article

[\[PDF\] Minimally invasive \(percutaneous\) treatment of metastatic spinal and extraspinal disease—a review](#)

V Salapura, M Jeromel - *Acta Clin Croat*, 2014 - pdfs.semanticscholar.org

SUMMARY—Metastatic tumors are the most common malignancy of bone. Many patients with spinal metastases present with pain and pathologic fractures. The advent of interventional radiology resulted in alternative and less invasive treatment of these patients. This article presents minimally invasive (percutaneous) procedures that are currently in use, ie vertebroplasty, kyphoplasty, osteoplasty, radiofrequency ablation, cryoablation, and ...

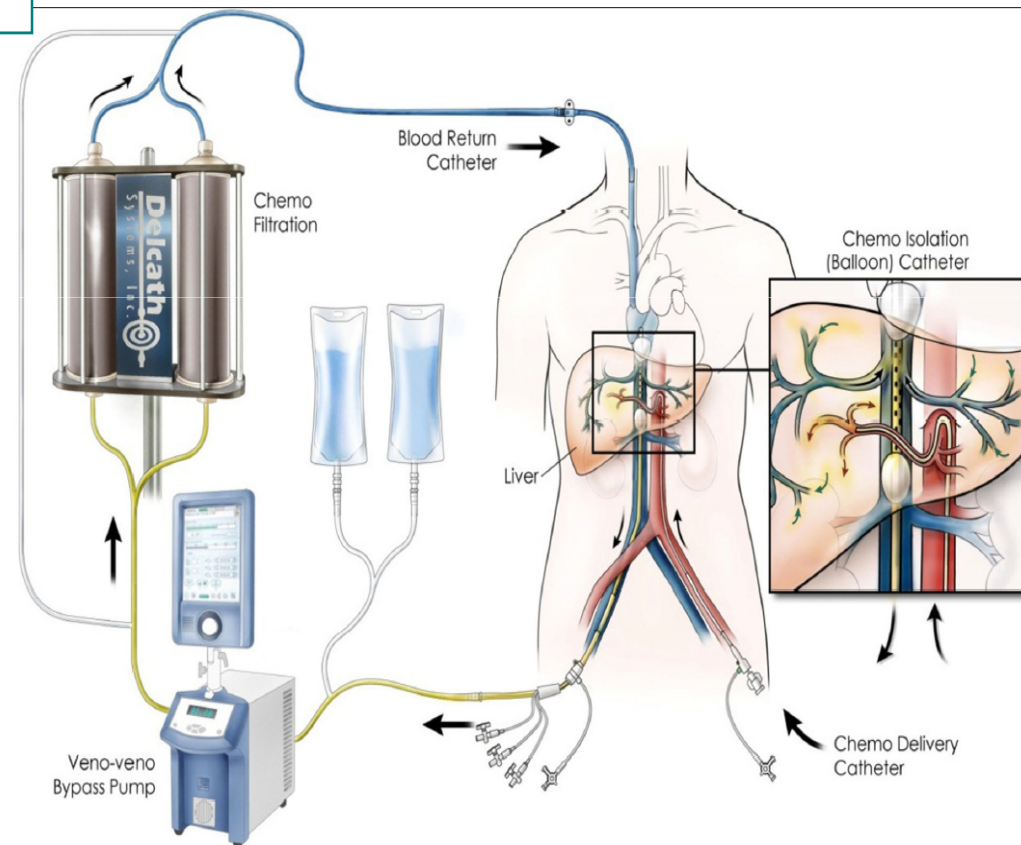
Adv Ther
DOI 10.1007/s12325-016-0424-4



REVIEW

Chemosaturation Percutaneous Hepatic Perfusion: A Systematic Review

Arndt Vogel · Sanjay Gupta · Martin Zeile · Rebecca von Haken · Roland Brüning ·
Gösta Lotz · Alexander Vahrmeijer · Thomas Vogl · Frank Wacker





Grazie per l'attenzione