saint 2013

9. Symposium für angewandte interventionsradiologische Techniken

Radiologische Interventionen

Extrahepatische Tumortherapie: Bauchhöhle & Becken – Was macht „Sinn“?

Prof. Dr. med. Philippe L. Pereira

SLK-Clinics, Am Gesundbrunnen, Heilbronn,
Ruprecht-Karls University of Heidelberg
Research , Eberhard-Karls-University Tübingen, Germany.

SLK-Kliniken

TUMORZENTRUM CANCER CENTER | heilbronn-franken

- Milz
- Rektum (Rezidiv bzw. lymphogen Metastase)
- GIST
- Pankreas
- Varia……

Milz und IR
Aktuelle Indikationen

- Bei partielle Splenektomie für Hemostase
- Milztrauma
- ➢Milz-Metastasen
- Hypersplenismus

“Ziel: Immunologische Funktion der Milz erhalten”

Ablation von Milz-Metastasen: Einleitung

- Milz-Metastasen sind selten
- Tumor-Debulking und Erhaltung der **immunologischen** Funktion
- Metastasen von Sarcomas, Ovar-Ca und NET

Ya-Qi Duan et al in Hepatogastroenterol 2013

- Milz als “only site of metastatic disease”

Milz-Metastasen: Wie oft?

1. **Epitheliales Ovar-Ca** +++ (¾)
2. **Lungenkrebs** (Medline: 15/267 [illegible]opsien 5.6%)
3. **CRC** (Medline 2013: nur cas[illegible]
    1. „0% isolated splenic mets / 1[illegible] patients with CRC
    2. 4.4% in 7,165 cases non isolated splenic mets“
4. **Mamma-, Magen-, Melanom, Uterus-, und Cervix-Ca. (2.3 bis 7.7%)**

Lymphom !!!

Ablation von Milz-Tumoren Rationalen

- Komplikationen post-Splenektomie: **bakterielle Infektionen** und **Sepsis** post-Splenektomie.

Ya-Qi Duan et al in Hepatogastroenterol 2013

- "It has been shown that preservation of at least **25% of the splenic parenchyma** ensures an adequate short- and long-term splenic function"

Radiofrequency Thermal Ablation of a Splenic Metastasis

Bradford J. Wood, MD and **Susan Bates, MD**
From the Special Procedures/Diagnostic Radiology Department (B.J.W.), Clinical Center, and National Cancer Institute, Medicine Branch (S.B.), National Institutes of Health Clinical Center, Bethesda, Maryland.

"55-yo man presented with a rapidly enlarging

5cm × 4cm solitary splenic metastasis from RCC:

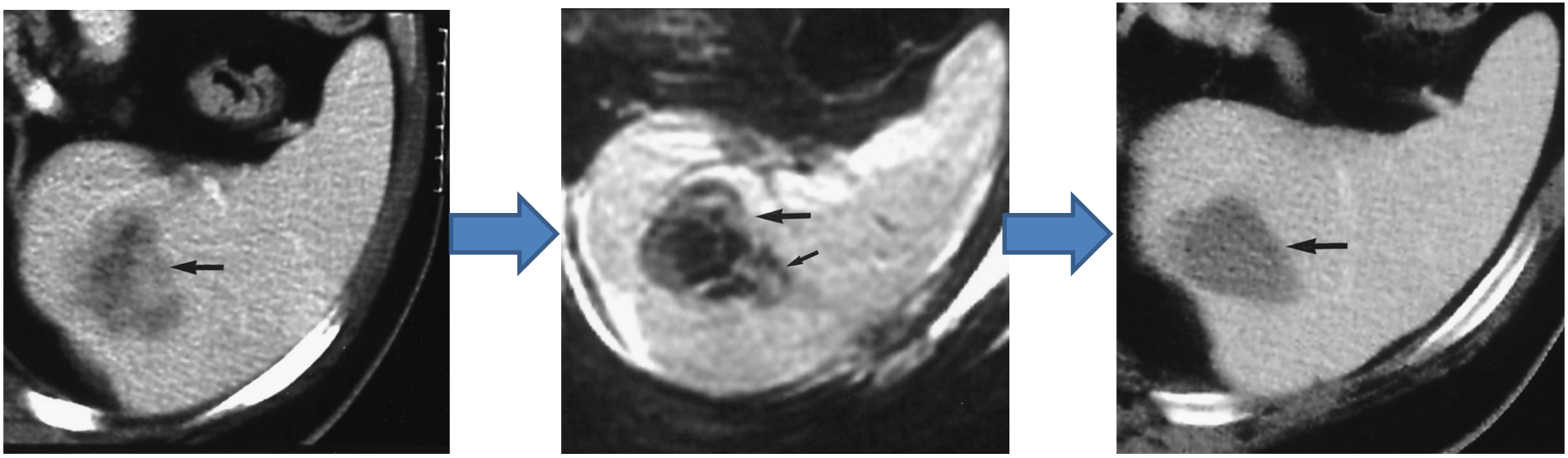
- **right nephrectomy for renal cell carcinoma**. He underwent **chemotherapy** with interleukin-2 and alpha interferon with **stable disease lung and retroperitoneal LN**
- **Spleen mets with growth rate** of which far outpaced the relatively stable, slow-growing lung and retroperitoneal disease.
- radiation therapy for a solitary femur metastasis"

B. Wood et al in JVIR 2001

Radiofrequency Thermal Ablation of a Splenic Metastasis

Bradford J. Wood, MD and **Susan Bates, MD**
From the Special Procedures/Diagnostic Radiology Department (B.J.W.), Clinical Center, and National Cancer Institute, Medicine Branch (S.B.), National Institutes of Health Clinical Center, Bethesda, Maryland.

- **cluster Cool-Tip triple RF-Applikator**
- **1.5 amp. für 12 Min**. Energie-Applikation
- Tract-Ablation
- Kein Schmerz und kein Opiaten oder Analgosedierung nach Ablation



Radiofrequency Ablation of Colorectal Splenic Metastasis

Anna Marangio[1], Ubaldo Prati[2], Ombretta Luinetti[3], Enrico Brunetti[1], Carlo Filice[1]

- *„right-sided hemicolectomy was performed in a 60-year-old woman because of **colorectal adenocarcinoma**.*
- *One year later, CT scan showed a **5-cm mass infiltrating the left side of the colon**, a **2-cm focal lesion in liver** segment IV that was contiguous to the middle hepatic vein, and **two nodular subcapsular lesions in the spleen** that measured 1 and 3 cm.*

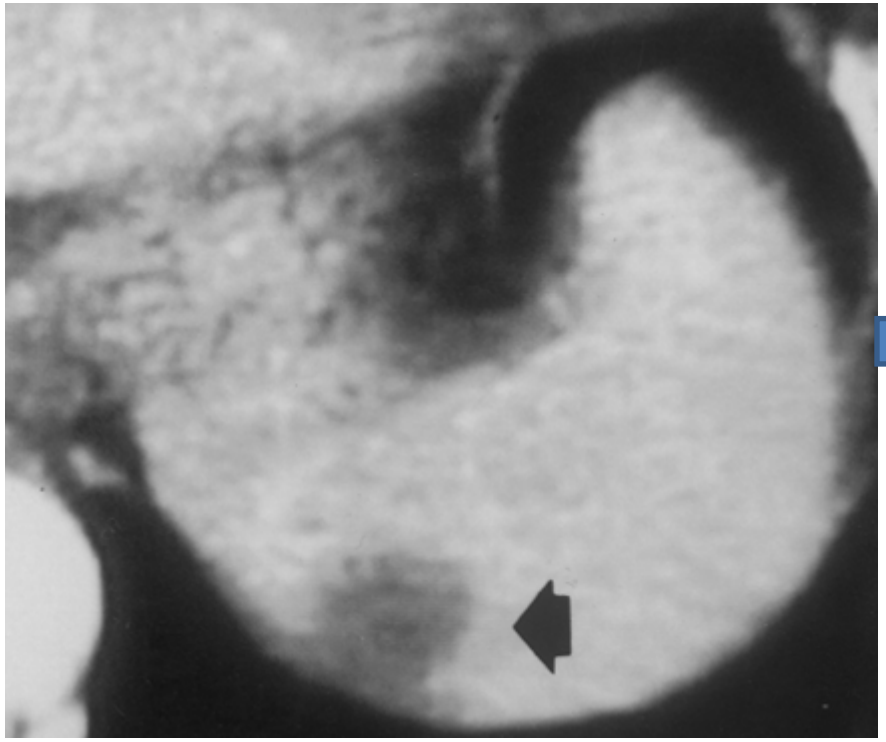
- *At surgery, the mass in the colon was found to be an **omental metastasis**. Omentectomy and ablation of the mass were performed together with **intraoperative radiofrequency ablation** of the hepatic lesion and, **before splenectomy, of one of two splenic lesions.**”*

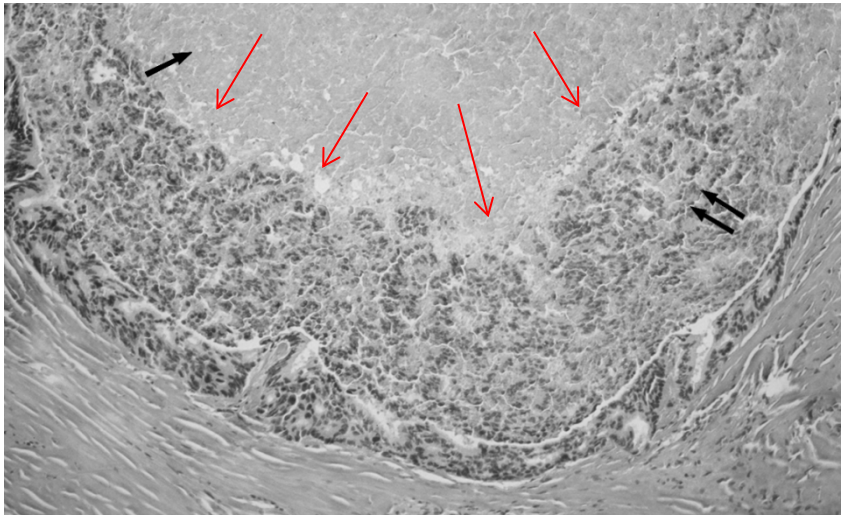
In AJR 2002

Radiofrequency Ablation of Colorectal Splenic Metastasis

Anna Marangio[1], Ubaldo Prati[2], Ombretta Luinetti[3], Enrico Brunetti[1], Carlo Filice[1]

- "**RF 2000 Radio Therapeutics, 100 W of power**. Once deployed, the 10-hook electrode array was expanded to a 3.5-cm diameter. Radiofrequency energy was applied with an initial power setting of 50 W, which is the standard protocol for hepatic lesions."



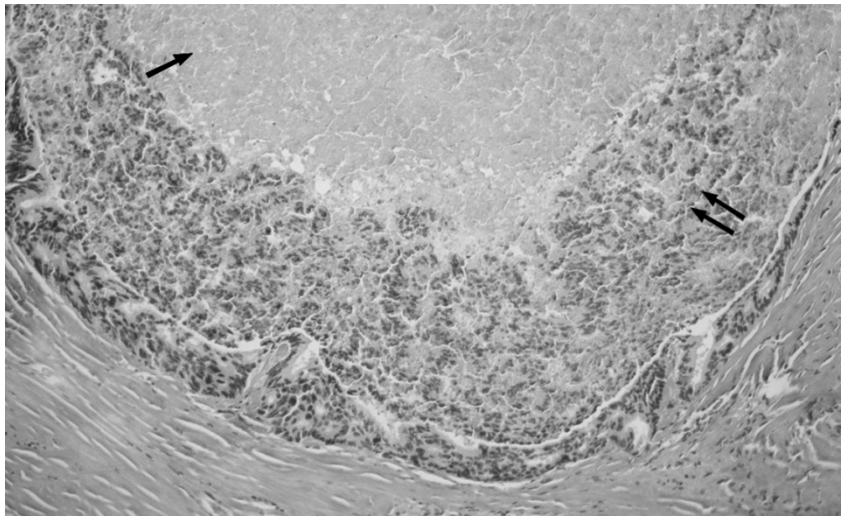


In AJR 2002

Radiofrequency Ablation of Colorectal Splenic Metastasis

Anna Marangio[1], Ubaldo Prati[2], Ombretta Luinetti[3], Enrico Brunetti[1], Carlo Filice[1]

- Milz-Metastasen sind **infiltrativ und selten enkapsuliert +++**
- **Hypervaskularisation der Milz =** heat sink effect und Limitation der Hitze-Verteilung
- Vorteil der intraoperativen Thermoablation = **„pseudo-Pringle“**



In AJR 2002

Ultrasound-guided percutaneous microwave ablation of splenic metastasis: Report of four cases and literature review

JIE YU[1], PING LIANG[1], XIAOLING YU[1], YANG WANG[2], & YONGYAN GAO[3]

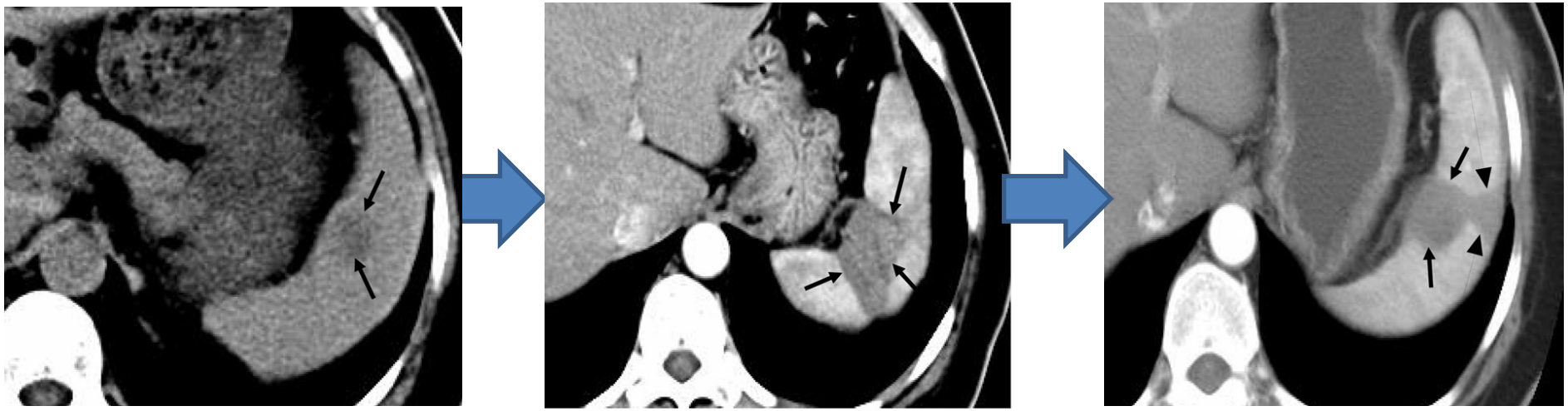
- *"**five pathologically proven splenic metastases** (from ovarian, pulmonary, gastric adenocarcinoma and HCC)*
- ***Size: 1.3 to 2.9 cm***
- ***60W for 10min.** and prolonged as necessary to attain temperatures sufficient to ensure tumour killing*
- *Microwave: For tumours **less than 1.5 cm, one antenna** was inserted, for tumours measuring **1.5 cm or greater, two antennae** were inserted with an inter-antenna distance of no more than **1.8 cm***
- ***Thermocouples: 60°C"***

In Int J Hyperthermia 2011

Ultrasound-guided percutaneous microwave ablation of splenic metastasis: Report of four cases and literature review

JIE YU[1], PING LIANG[1], XIAOLING YU[1], YANG WANG[2], & YONGYAN GAO[3]

- **Komplette Ablation der Metastasen ohne Komplikationen, in einer Sitzung. Kein Rezidiv mit** follow up 22±17.1 Mon. (range 4-43 mo.).



"Advantage for MWA over RFA: MWA is less affected by the perfusion 'heat-sink' effect"

In Int J Hyperthermia 2011

Thermal Ablation: Milz und Komplikationen

- + Transitorisches Fieber (37-38℃)
- + symptomatischer Pleuraerguß
- + Abdominaler Schmerz
- + Schulterschmerz li.
- Hemoglobinuria und Hämaturie
- PVT
- Intraabdominale Blutung

Yu J et al, in Int J Hyperthermia 2011

- "Splenic rupture, refractory ascites, thermal injuries of adjacent organs including pancreas, stomach and colon, acute liver dysfunction and acute pancreatitis have not been reported."

- ✓ Milz
- ➢ **Rektum (Rezidiv bzw. lymphogen Metastase)**
- ➢ GIST
- ➢ Pankreas
- ➢ Varia……

Tumortherapie: Rektum-Ca. Rezidiv Rationalen für IO

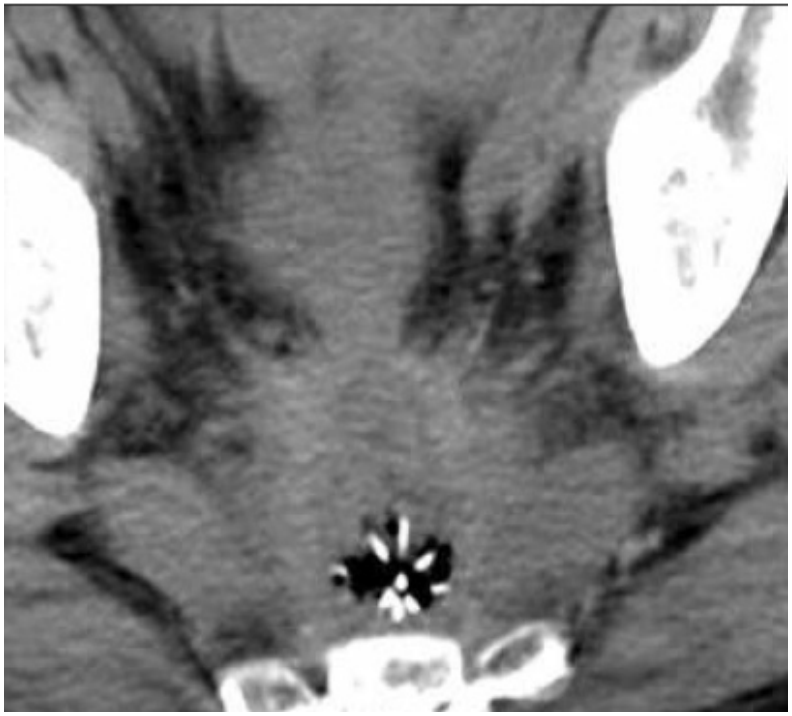
- Lokalrezidiv nach OP in **11.3% * - 30%****
- Re-OP, CTx und XRt sind palliativ
- Nicht therapierbares Lokalrezidiv = **mOS 8 mo.****
- **XRt und CTx:** 5-y Überleben < 5%
- 1. Ziel der Therapie: Schmerz-Kontrolle **("Sitting impairment")**

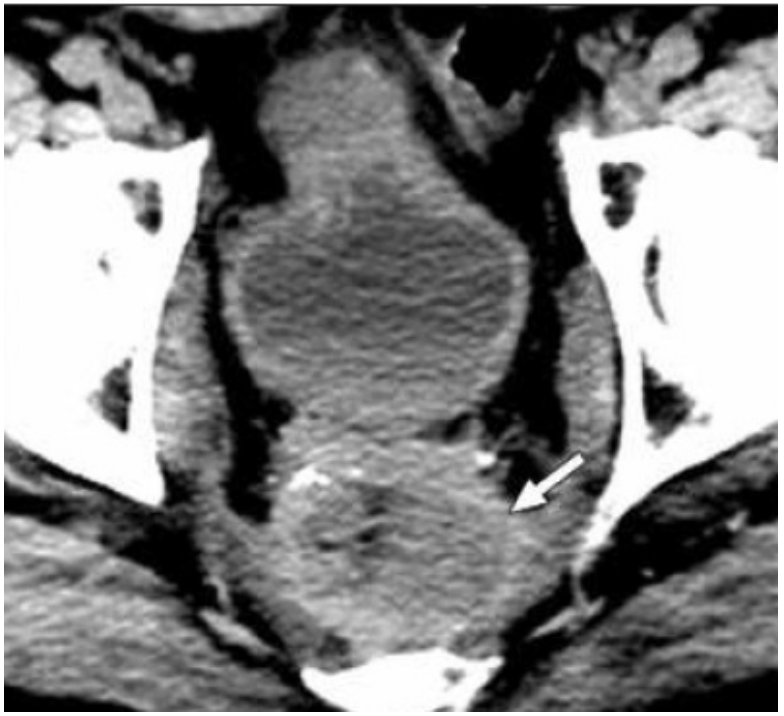
**Yun HR et al in Colorectal Dis 2008; **Yoshihiro M et al in Jpn J Clin Oncol 2006;*
****Hahnloser D et al in Ann Surg 2003*

Giuseppe Belfiore[1]
Enrico Tedeschi[1]
Francesco Michele Ronza[2]
Maria Paola Belfiore[1]
Ettore Borsi[3]
Giovanni Pietro Ianniello[4]
Antonio Rotondo[2]

CT-Guided Radiofrequency Ablation in the Treatment of Recurrent Rectal Cancer

- Palliative CT-gesteuerte RFA in **14 Patienten mit Rektum-Ca-Rezidiv** bei Z.n. Radiochemotherapie und TME/PME.





In AJR 2008

Giuseppe Belfiore[1]
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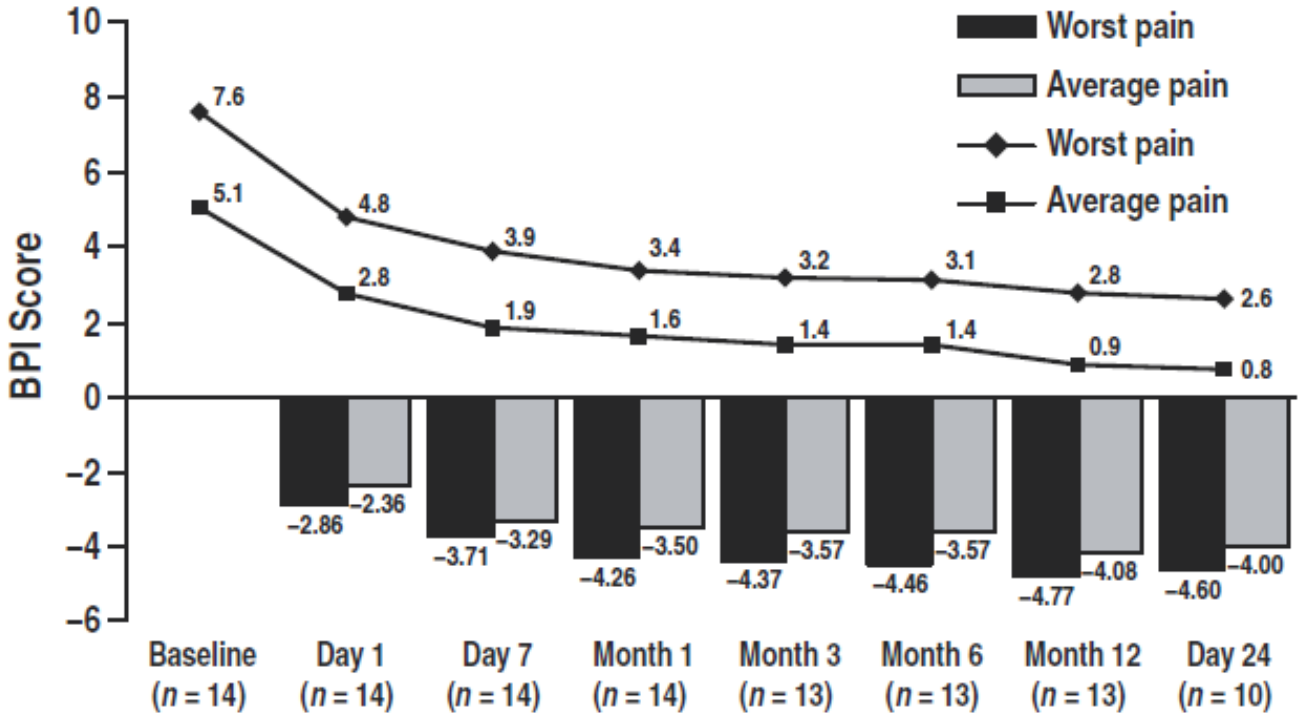


In AJR 2008

Palliative Treatment of Rectal Carcinoma Recurrence Using Radiofrequency Ablation

Sophia Mylona · Georgios Karagiannis · Sofia Patsoura · Panagiota Galani · Maria Pomoni · Loukas Thanos

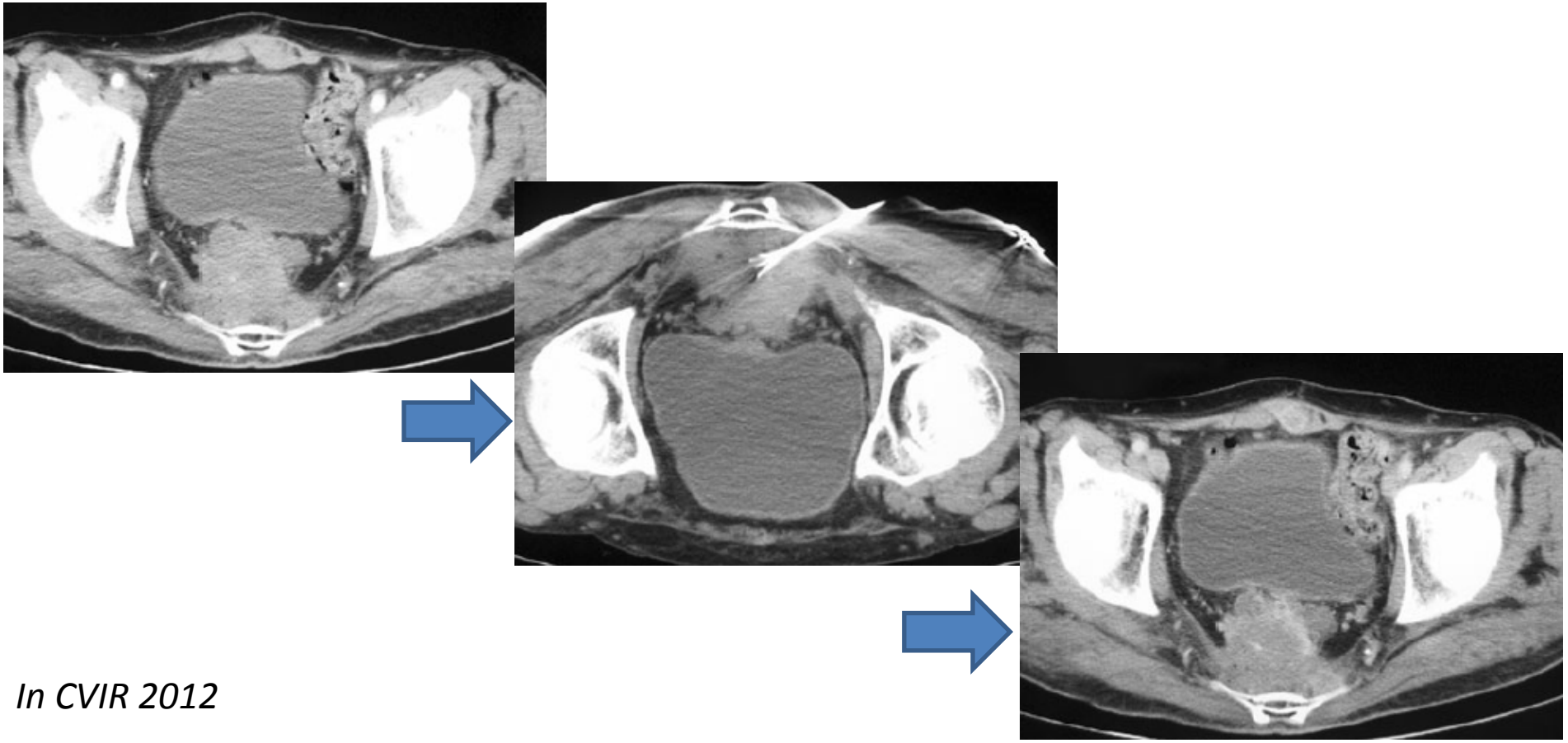
- N=27 Patienten mit lokalem Rektum-Ca.-Rezidiv
- CT-gesteuerte RF Ablation.
- 7- oder 9-array **expandierbare RF Applikator 8–10 min @ 80–110°C mit Output 90–110W**.

In CVIR 2012

Palliative Treatment of Rectal Carcinoma Recurrence Using Radiofrequency Ablation

Sophia Mylona · Georgios Karagiannis · Sofia Patsoura · Panagiota Galani · Maria Pomoni · Loukas Thanos

- N=27 Patienten mit lokalem Rektum-Ca.-Rezidiv



In CVIR 2012

Palliative Treatment of Rectal Carcinoma Recurrence Using Radiofrequency Ablation

Sophia Mylona · Georgios Karagiannis · Sofia Patsoura · Panagiota Galani · Maria Pomoni · Loukas Thanos

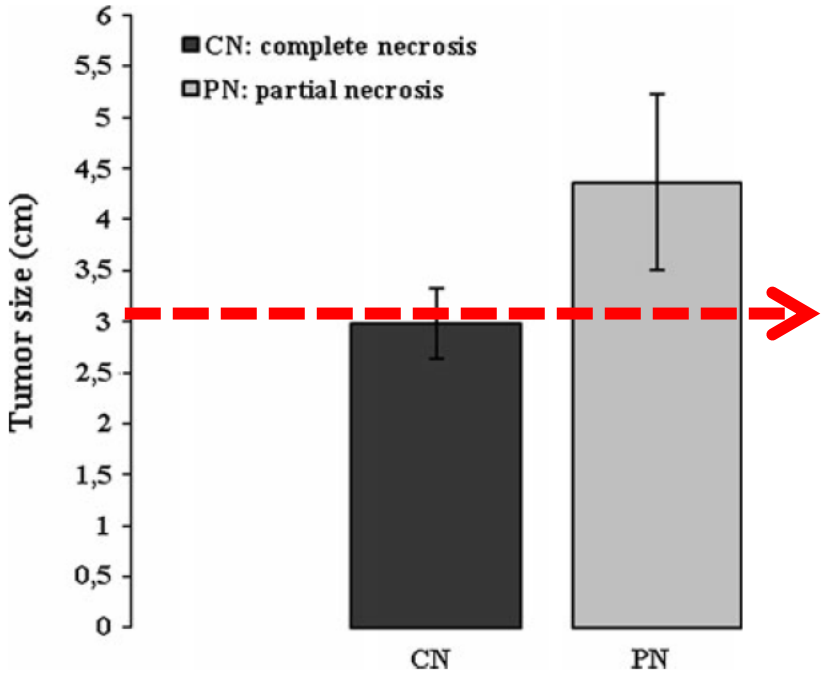
- **Komplette Tumorablation (Bildgebung): 77.8%** (21/27 Patienten)
- N=6 Pat. mit inkompletter Tumornekrose, und zweite RFA
- Keine Minor- oder Major-Komplikationen

In CVIR 2012

Palliative Treatment of Rectal Carcinoma Recurrence Using Radiofrequency Ablation

Sophia Mylona · Georgios Karagiannis · Sofia Patsoura · Panagiota Galani · Maria Pomoni · Loukas Thanos

- **Komplette Tumorablation (Bildgebung): 77.8%**



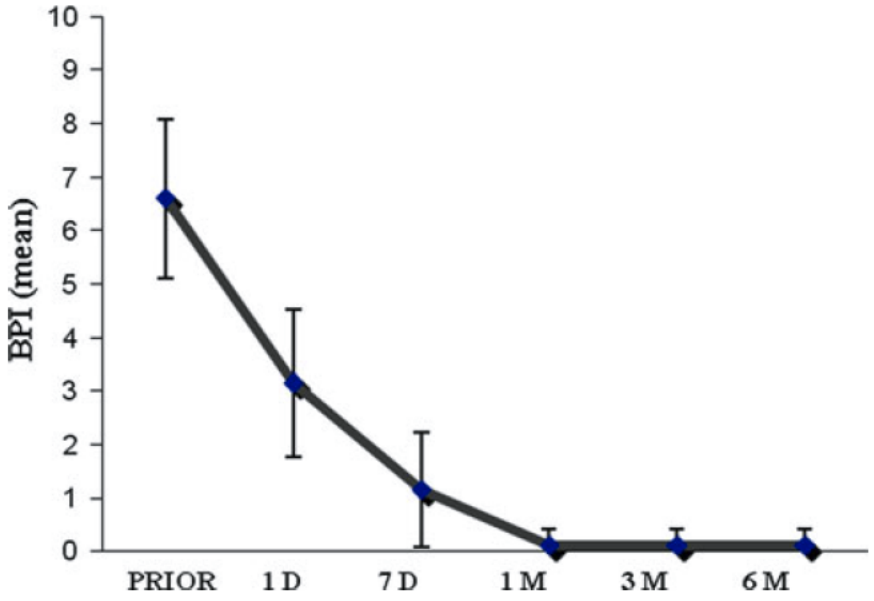


Fig. 2 BPI score shows a remarkable decrease during post-procedural week 1 and a complete pain control after 1 month

In CVIR 2012

- ✓ Milz
- ✓ Rektum (Rezidiv bzw. lymphogen Metastase)
  - ➢ **GIST**
  - ➢ Pankreas
  - ➢ Varia…….

Klinisch relevanter GIST sind seltene Tumore

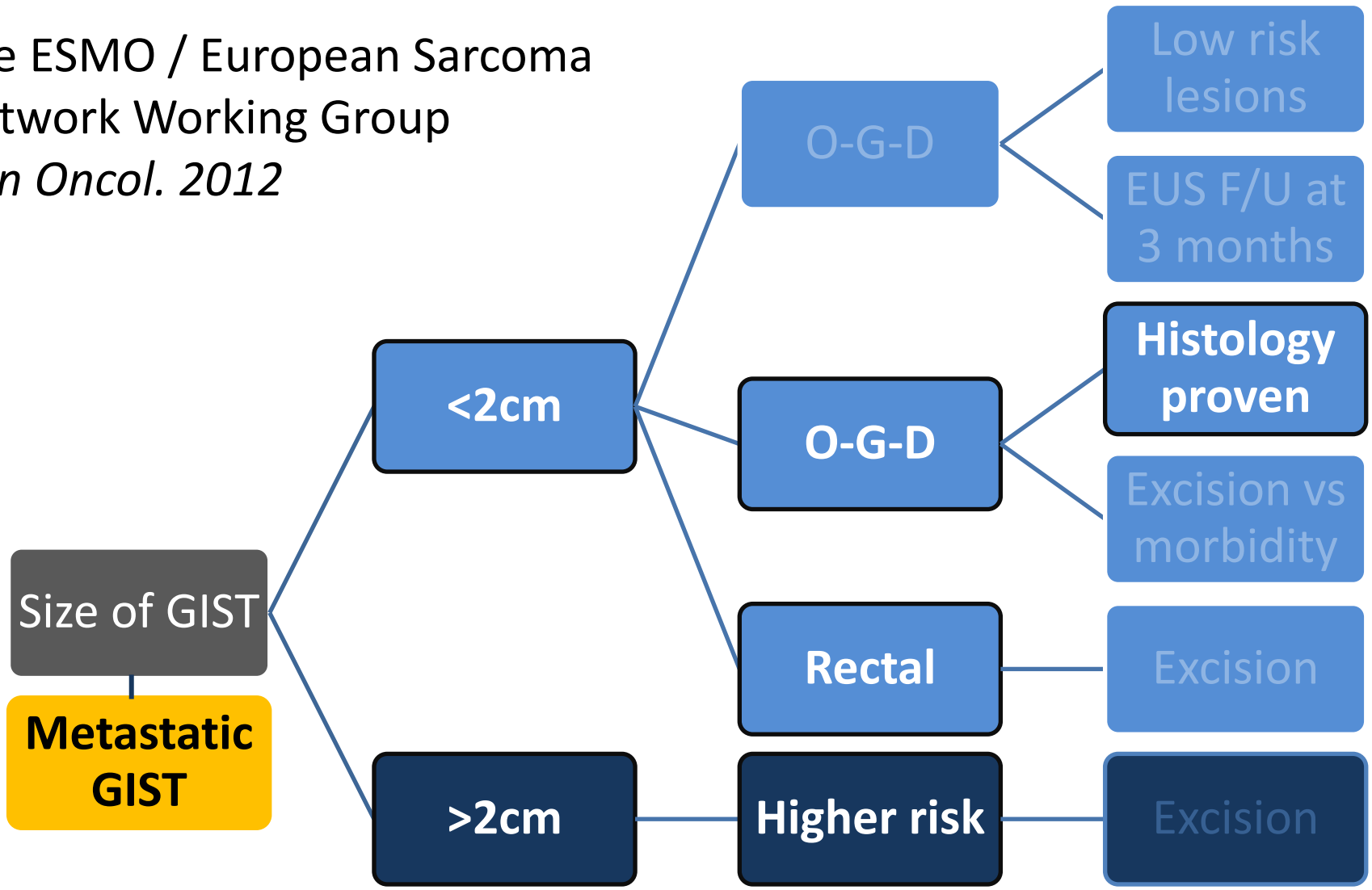
- Inzidenz: **1.5/100 000 per anno**
- Mittl. Alter: 60-65 years
- **Pediatrischer GIST**: f>m, no Kit Mutationen, gastrisch multizentrisch und LKs
- **Carney Triad Syndrom**: gastrischer GIST, paragangliome, pulmonale Chondrome
- **Typ I NFM**: wt-GISTs, multizentrisch und oft Dünndarm
- **Carney Stratakis Syndrom**: GISTs und Paragangliome

Gastrointestinale stromale Tumore

- Bei der E.D: **55-72% der GISTs haben metastasiert**
- **Oft nur Lebermetastasen**
- Aktuell: Therapie der Wahl ist die chirurgische Resektion und/oder **MKi**

„GIST that should be treated !“

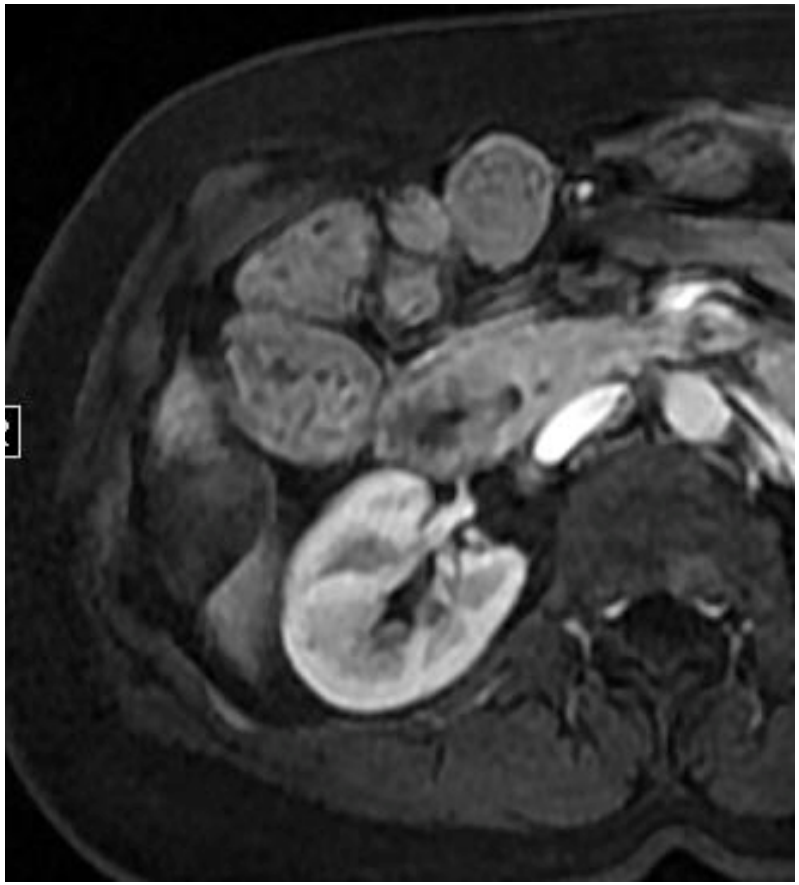
The ESMO / European Sarcoma Network Working Group
Ann Oncol. 2012



Potenziell neue Indikationen für IO

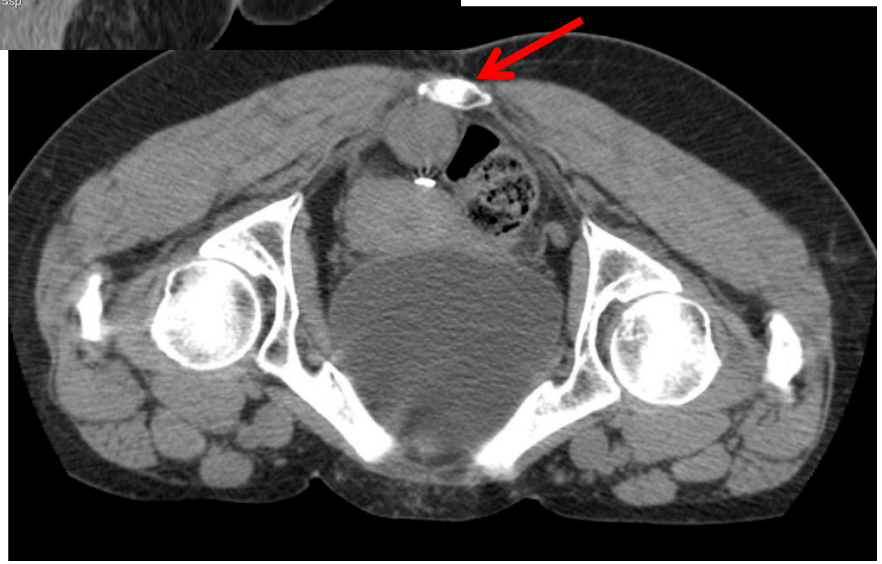
- **Standard Therapie ist die Resektion** (endoscopisch, laparoscopisch, Laparotomie), aber hohe Morbidität, auch ohne Dissektion der met. LK ++
- **Peritoneale Tumorzell-Verschleppung**, insbesondere in zystischen GISTs
- Wenn eine R0-Chirurgie….
  - Hohe Morbidität
  - Funktionelle **sequelae**

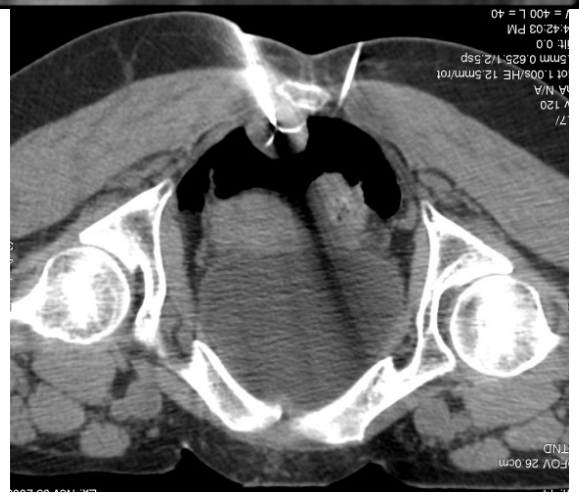
Potenziell neue Indikationen für IO
Primärtumor GIST



Courtesy Dr Hakime, Paris.

Potenziell neue Indikationen für IO
Primärtumor GIST





Courtesy Dr Hakime, Paris.

Two Hundred Gastrointestinal Stromal Tumors

Recurrence Patterns and Prognostic Factors for Survival

Ronald P. DeMatteo, MD,* Jonathan J. Lewis, MD, PhD,* Denis Leung, PhD,† Satvinder S. Mudan, MD,*
James M. Woodruff, MD,‡ and Murray F. Brennan, MD*

*From the Departments of *Surgery, †Biostatistics, and ‡Pathology, Memorial Sloan-Kettering Cancer Center, New York City, New York*

Klinischer Verlauf von n=200 Patienten mit GIST

- **“46% had primary disease without metastasis**
- **47% had metastasis +++**
- 7% had isolated local recurrence.
- In patients with primary disease who underwent complete resection of gross disease (n = 80), the **5-year survival rate was 54%“**

In Ann Surg. 2000

Drei Strategien !!!

Strategie A: RFA of residual tumours to interrupt systemic treatment

Strategie B: RFA upon best clinical response to imatinib to prevent subsequent resistance to imatinib and prolongs its activity

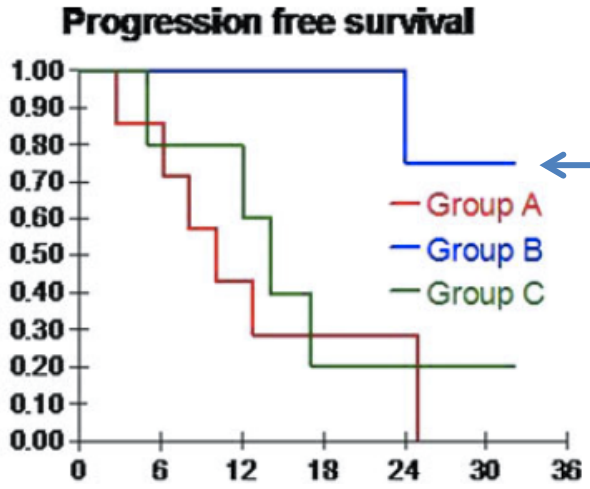
Strategie C: RFA when focal progression after imatinib is detected to prolong the time the patient can continue to receive imatinib and postpone the switch to a second-line treatment

In CVIR 2013

A Role for Adjuvant RFA in Managing Hepatic Metastases from Gastrointestinal Stromal Tumors (GIST) After Treatment with Targeted Systemic Therapy Using Kinase Inhibitors

Antoine Hakimé · Axel Le Cesne · Frederic Deschamps · Geoffroy Farouil · Sana Boudabous · Anne Aupérin · Julien Domont · Thierry Debaere

	Progression-free survival rate (95 % confidence interval)				Median FU (mo)
	6 months	12 months	18 months	24 months	
Group A	58.7 % (49–97)	42.9 % (16–75)	28.6 % (8–64)	28.6 % (8–64)	74.5
Group B	100 %	100 %	100 %	75 % (30–95)	29.6
Group C	80 % (38–96)	60 % (23–88)	20 % (4–62)	20 % (4–62)	53.9



- **Group A** (7 pats), RFA of all residual liver tumors, no Tki
- **Group B** (5 pats), RFA agap, with adjuvante TKI therapy
- **Group C** (5 pats), RFA was performed on individual liver metastases which were progressive under TKI therapy.

In CVIR 2013

Mean tumour diameter was 2.5 ± 1 cm [0.9–4.5 cm]

Comments GIST and IO

- Patienten mit inoperablen GISTs (oder hohe Morbidität +++) **imatinib** ist die Standard-Therapie (IIIA)
- Second-line Therapie **sunitinib** (IIIB)*
- Wenn R0 nicht möglich oder high-risk Chirurgie, neoadjuvante imatinib (6-12 mo.)
- Adjuvante Therapie nach Resektion oder Ablation mit imatinib für 3 Jahre zeigt eine besseres DFS und OS in einer randomisierten Studie** mit high-risk Patienten

*Demetri GD et al. In N Engl J Med 2002; *George S, et al. in Eur J Cancer 2009; **Joensuu H, et al. in JAMA 2012. Hakime et al. CVIR 2013*

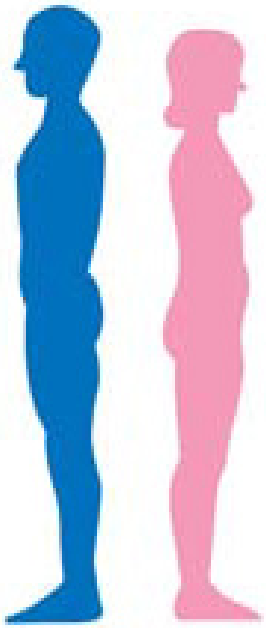
- ✓ Milz
- ✓ Rektum (Rezidiv bzw. lymphogen Metastase)
- ✓ GIST
- ➢ Pankreas
- ➢ Varia…….

Tumortherapie: Pankreas Rationalen für IO

- RO Resektion ist die einzige kurative Therapie des Adenokarzinoms
- Nur 5-22% der Patienten sind OP
- **1-y Überleben: 20%, 5-y Überleben < 5%**
- CTx: Gemcitabine, FOLFORINOX

2008, Estimated new cases of cancer

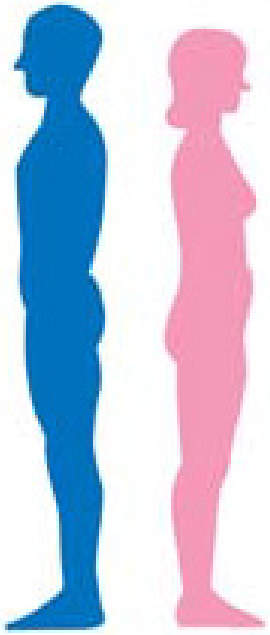
Males				Females		
Prostate	186,320	25%		Breast	182,460	26%
Lung & bronchus	114,690	15%		Lung & bronchus	100,330	14%
Colon & rectum	77,250	10%		Colon & rectum	71,560	10%
Urinary bladder	51,230	7%		Uterine corpus	40,100	6%
Non-Hodgkin lymphoma	35,450	5%		Non-Hodgkin lymphoma	30,670	4%
Melanoma of the skin	34,950	5%		Thyroid	28,410	4%
Kidney & renal pelvis	33,130	4%		Melanoma of the skin	27,530	4%
Oral cavity & pharynx	25,310	3%		Ovary	21,650	3%
Leukemia	25,180	3%		Kidney & renal pelvis	21,260	3%
Pancreas	18,770	3%		Leukemia	19,090	3%
All Sites	**745,180**	**100%**		**All Sites**	**692,000**	**100%**



***Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.**
Source: American Cancer Society, 2010.

2008, Estimated Deaths

Males			Females		
Lung & bronchus	90,810	31%	Lung & bronchus	71,030	26%
Prostate	28,660	10%	Breast	40,480	15%
Colon & rectum	24,260	8%	Colon & rectum	25,700	9%
Pancreas	17,500	6%	Pancreas	16,790	6%
Liver & intrahepatic bile duct	12,570	4%	Ovary	15,520	6%
Leukemia	12,460	4%	Non-Hodgkin lymphoma	9,370	3%
Esophagus	11,250	4%	Leukemia	9,250	3%
Urinary bladder	9,950	3%	Uterine corpus	7,470	3%
Non-Hodgkin lymphoma	9,790	3%	Liver & intrahepatic bile duct	5,840	2%
Kidney & renal pelvis	8,100	3%	Brain & other nervous system	5,650	2%
All Sites	**294,120**	**100%**	**All Sites**	**271,530**	**100%**



***Excludes basal and squamous cell skin cancers and in situ carcinomas except urinary bladder.**
Source: American Cancer Society, 2010.

Elmar M. Merkle, MD
John R. Haaga, MD
Jeffrey L. Duerk, PhD
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Hans-Juergen Brambs, MD
Jonathan S. Lewin, MD

Index terms:
Interventional procedures,

MR Imaging–guided Radio-frequency Thermal Ablation in the Pancreas in a Porcine Model with a Modified Clinical C-Arm System[1]

CONCLUSION: MR imaging–guided RF thermal ablation in the pancreas is feasible and safe. Induced thermal lesion size can best be monitored with STIR and contrast-enhanced T1-weighted images. In the future, RF ablation may offer an alternative treatment option for pancreatic cancer.

Goldberg SN, Mallery S, Gazelle GS, Brugge WR (**1999**) EUS guided radiofrequency ablation in the pancreas: **results in a porcine model**. Gastrointest Endosc 50:392–401

Matsui Y, Nakagawa A, Kamiyama Y, Yamamoto K, Kubo N, Nakase Y (**2000**) Selective **thermocoagulation of unresectable pancreatic** cancers by using radiofrequency capacitive heating. Pancreas 20:14–20

Date RS, Biggins J, Paterson I, Denton J, McMahon RF, Siriwardena AK (**2005**) Development and **validation of an experimental model** for the assessment of radiofrequency ablation of pancreatic parenchyma. Pancreas 30:266–271

Minimally invasive therapies have good survival rate for patients with unresectable pancreatic cancer

Zhi-Mei Huang[1*], Chang-Chuan Pan[2*], Pei-Hong Wu[1], Ming Zhao[1], Wang Li[1], Zi-Lin Huang[1] and Rui-Yang Yi[3]

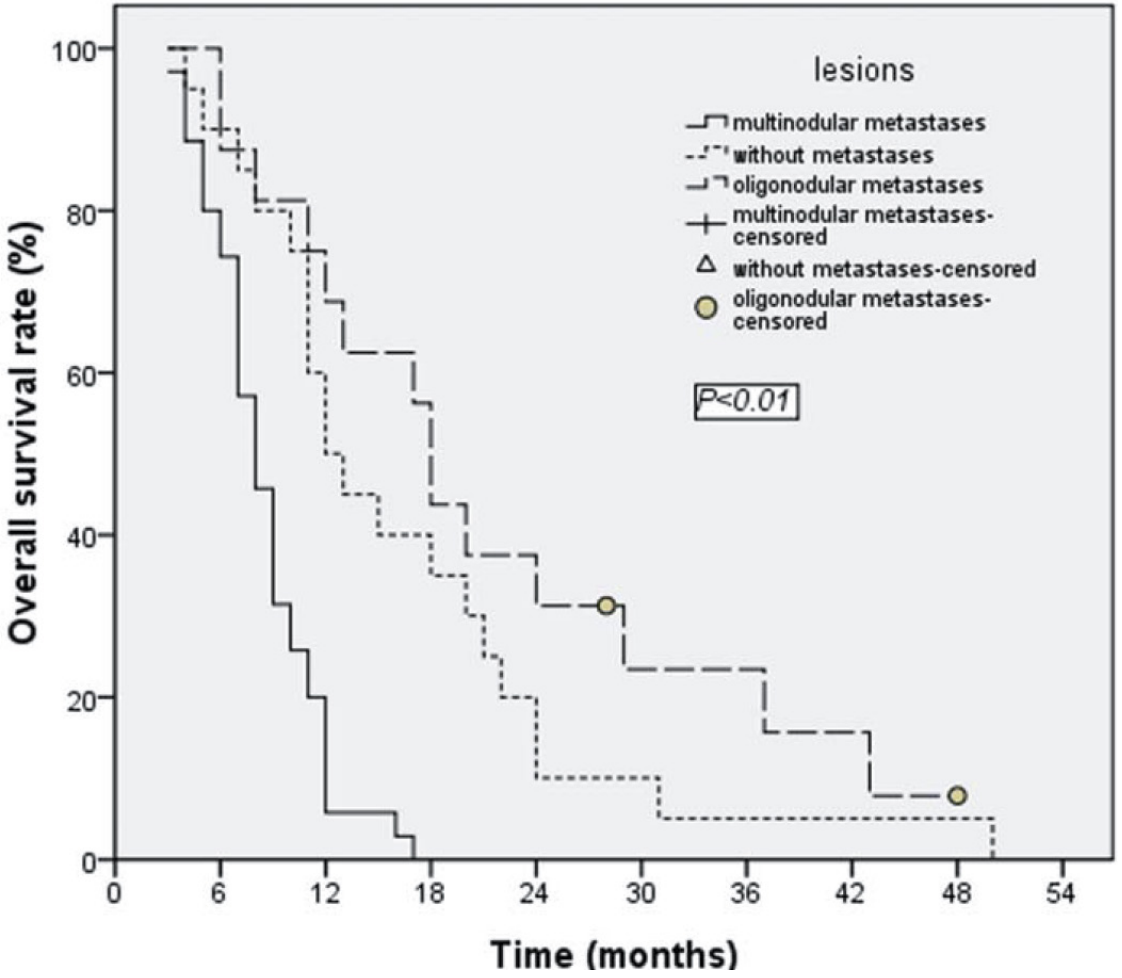
- **N=71 Patienten mit nicht resektablem Pankreas-Ca.**
- TACE + RFA und/oder Seeds Implantation.
- **mittleres Überleben = 11 mo.**
- **1-y**, 2-y und 3-y OSR sind **32.4%**, 9.9% und 6.6%

Published in 2012

CJC CHINESE JOURNAL OF CANCER

Chinese Journal of Cancer

Chinese Journal of Cancer



NPP bei multivariate analyse: **“Nb of hepatic mets.”**

Minimally Invasive Ablation Treatment for Locally Advanced Pancreatic Adenocarcinoma

Michele Rossi · Gianluigi Orgera · Adam Hatzidakis · Miltiadis Krokidis

- PubMed, EMBASE und the Cochrane Library mit Syntax ‘(radiofrequency OR RFA) AND (pancreas OR pancreatic)’
- Studien mit < 5 Patienten wurden ausgeschlossen

Ergebnisse:

- **5 studien mit n=158 Patienten mit RFA des Pankreas-Ca.**
- **Mittleres Überleben nach RFA = 3–33 mo.**
- **Morbidität der RFA: 4–37%**
- **Mortalität: 0–19%** und overall morbidity of 10–43%.

In CVIR 2012

Percutaneous **irreversible electroporation** for downstaging and control of unresectable pancreatic adenocarcinoma.

Narayanan G, Hosein PJ, Arora G, Barbery KJ, Froud T, Livingstone AS, Franceschi D, Rocha Lima CM, Yrizarry J.

J Vasc Interv Radiol. 2012 Dec;23(12):1613-21. doi: 10.1016/j.jvir.2012.09.012

Rapid dramatic alterations to the tumor microstructure in pancreatic cancer following **irreversible electroporation** ablation.

Zhang Z, Li W, Procissi D, Tyler P, Omary RA, Larson AC.

Nanomedicine (Lond). 2013 Sep 11. [Epub ahead of print]

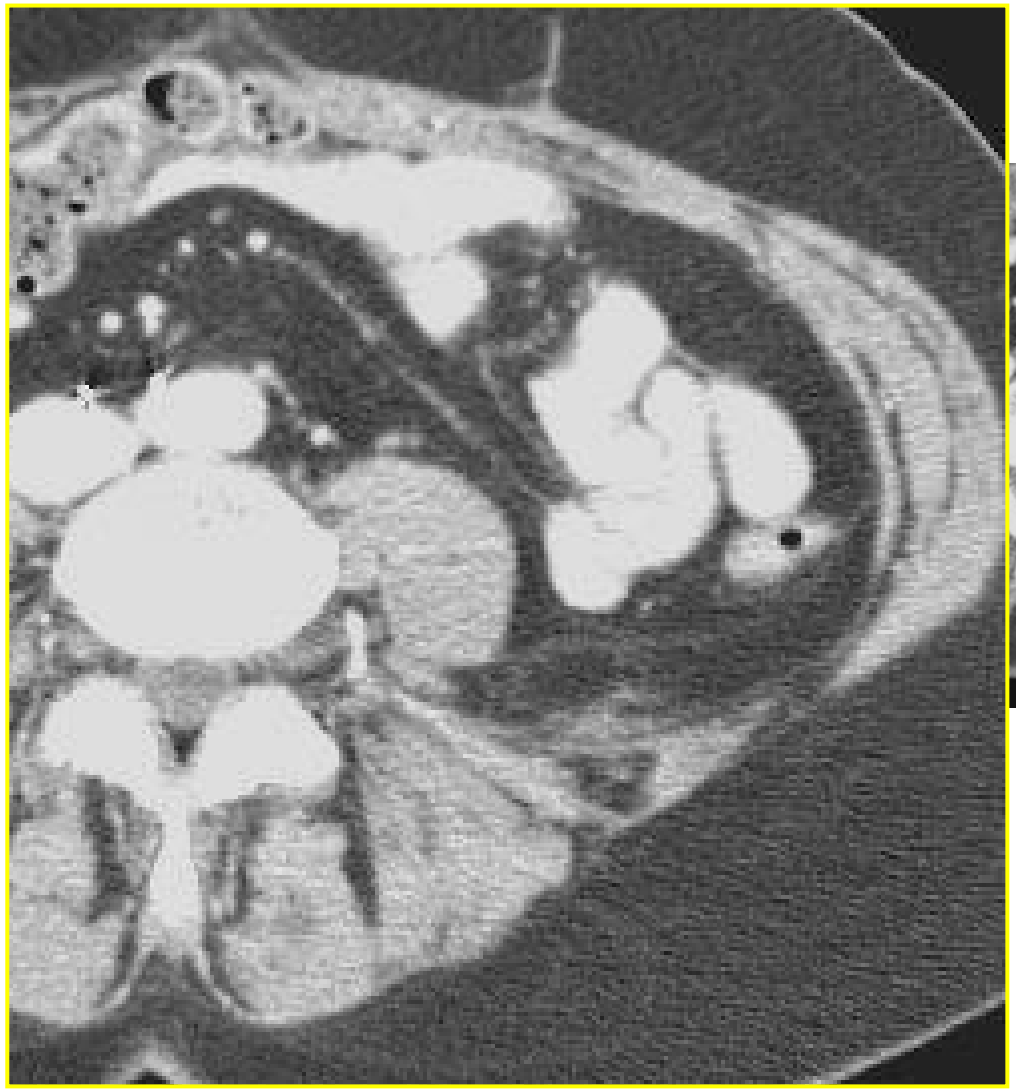
Irreversible Electroporation of Locally Advanced Pancreatic Head Adenocarcinoma.

Martin RC.

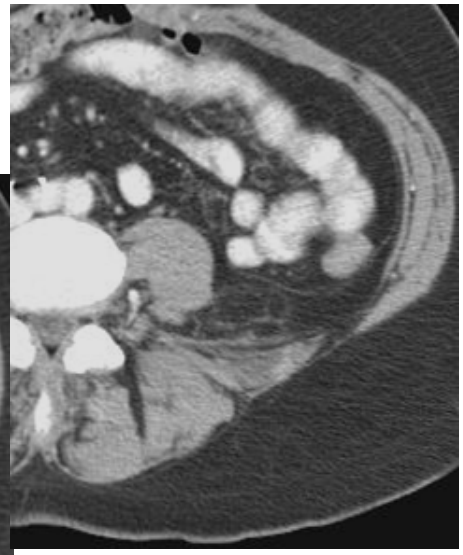
J Gastrointest Surg. 2013 Aug 9. [Epub ahead of print]

- ✓ Milz
- ✓ Rektum (Rezidiv bzw. lymphogen Metastase)
- ✓ GIST
- ✓ Pankreas
- ➢ **Varia……**

Ablation einer symptomatischen Metastase bei einem Ovar-Ca.



F/U at 1 mo.

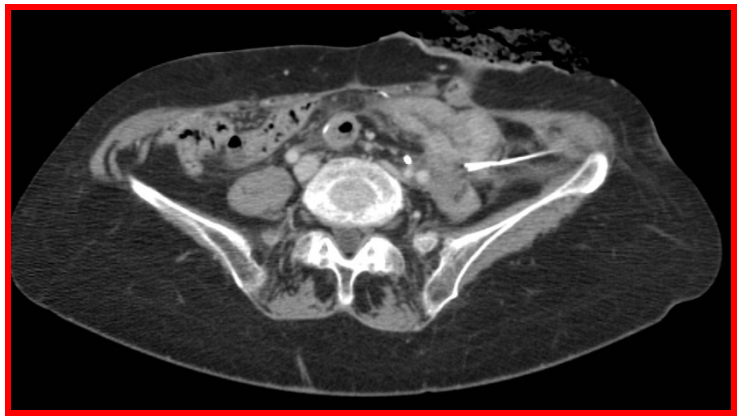


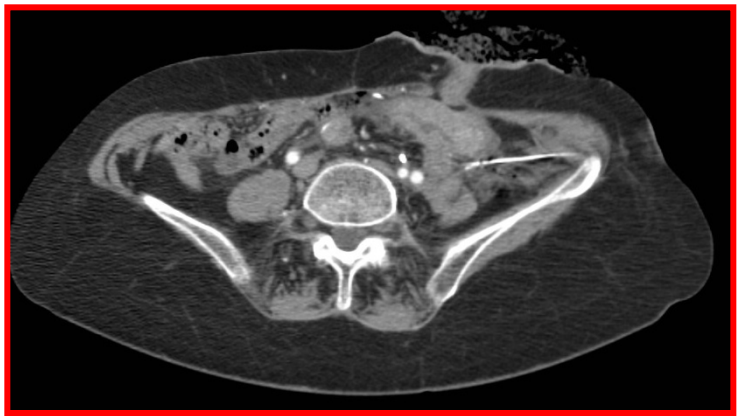
F/U at 3 mo.

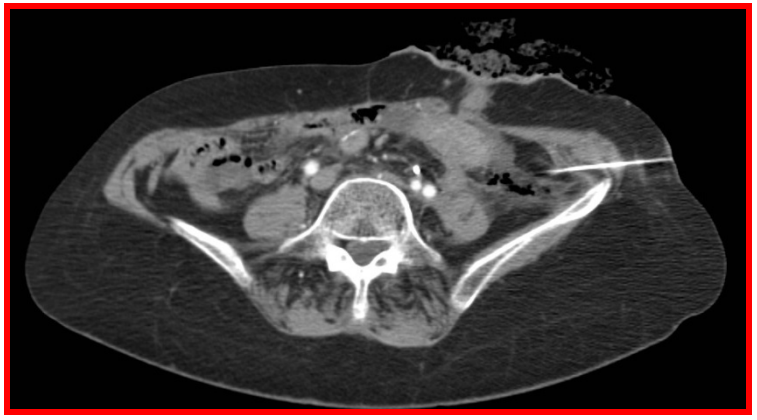
Pitfalls

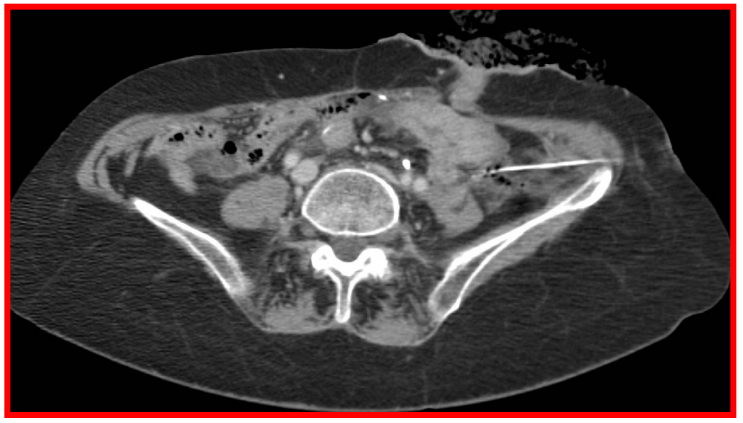
Ablation einer Metastase bei Ovar-Ca

Slides from D. Gervais







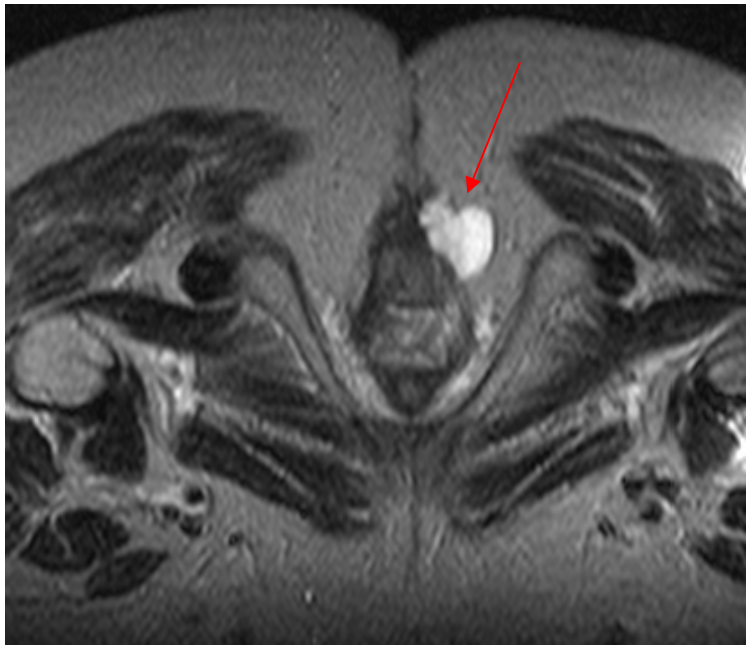


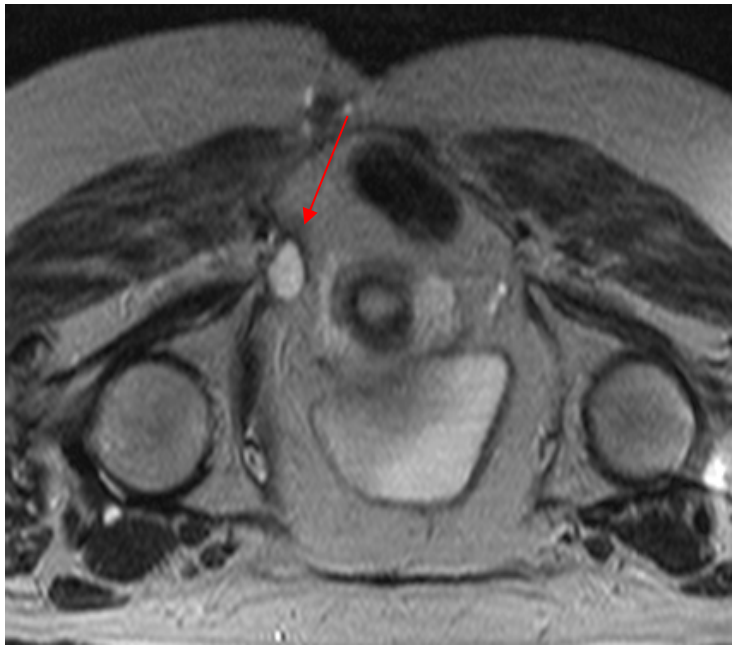
3 Months Later

Slide from D. Gervais

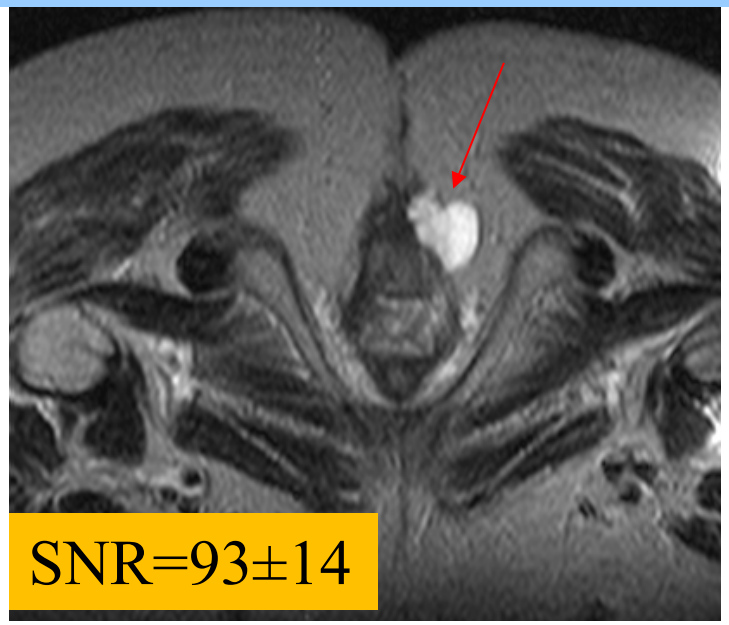
Ablation zweier symptomatischen Chordome

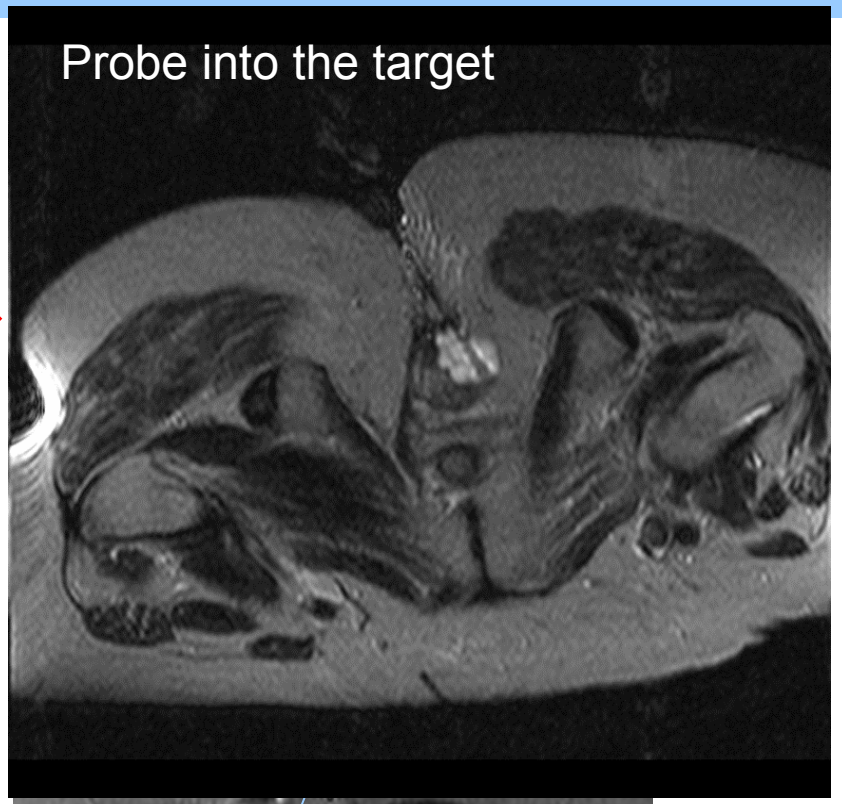
- Chordomas: “nucleus pulposus like structure”
- Parameter der Ablation?

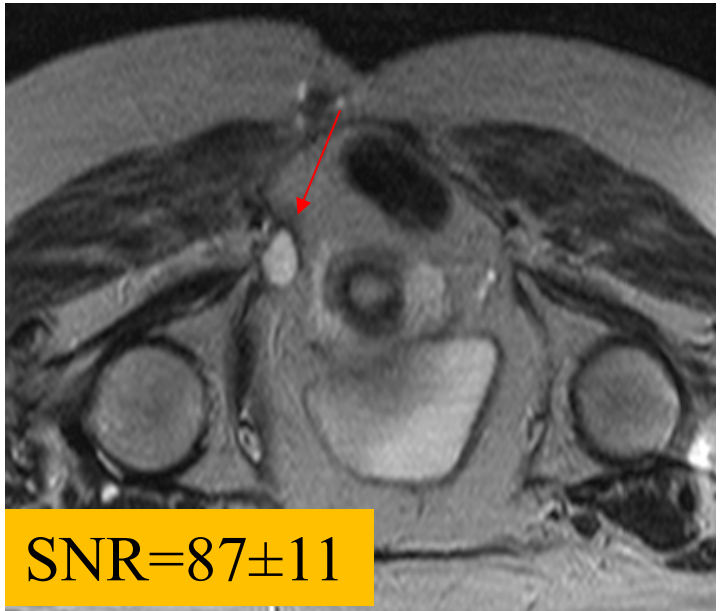


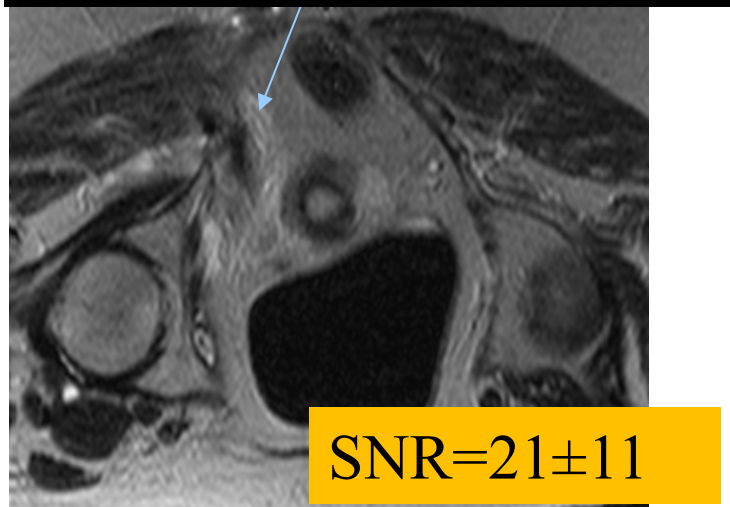


SNR and Signal changes on T2w-imaging

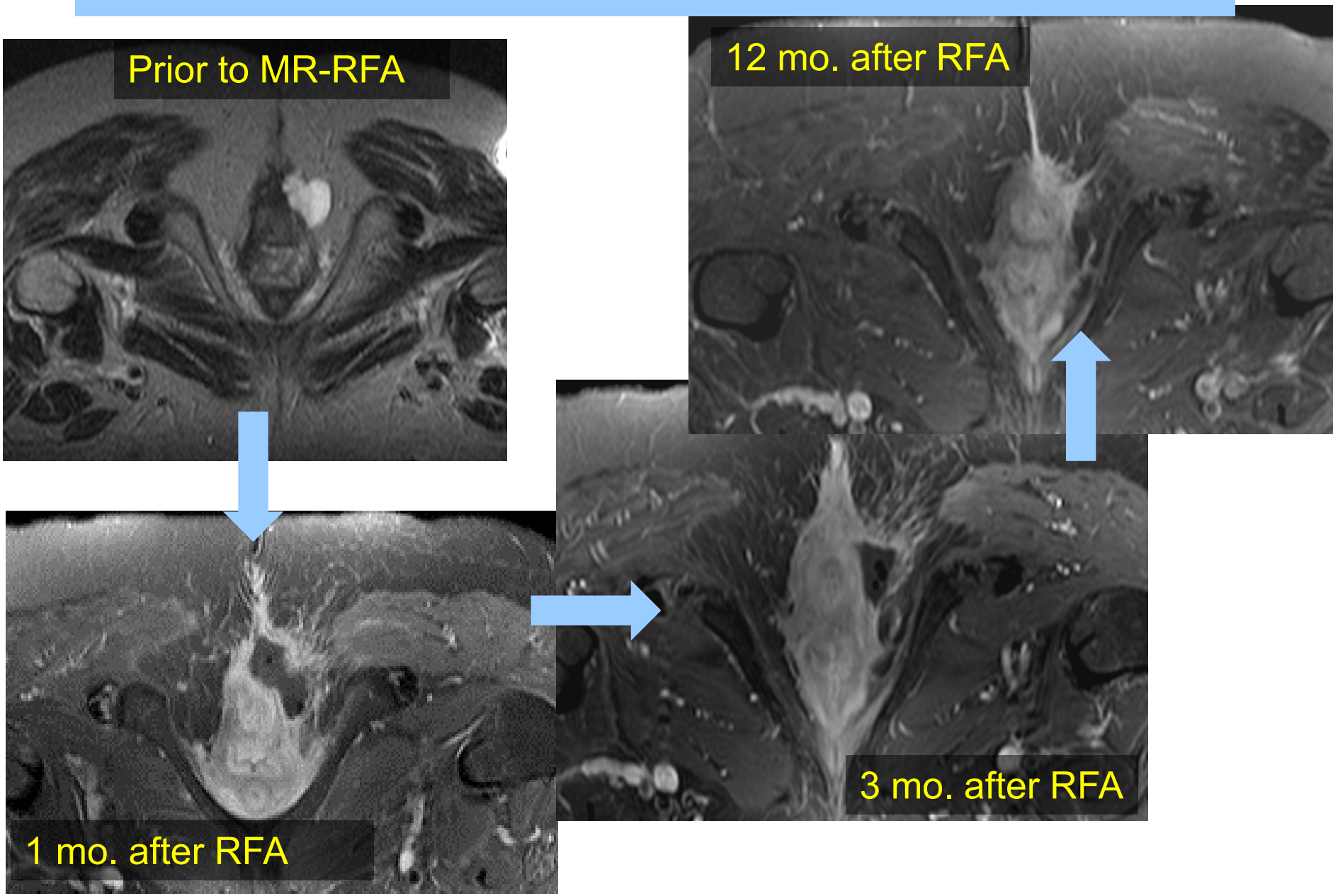








Chordomas und Ablation: F/U



Bauchhöhle und Becken

- **“Technisch möglich” bedeutet nicht “sinnvoll” !!**
- **Meist sind Kombinationstherapien sinnvoller**
- **Limitationen der Ablation:**
  - **Systemerkrankung**
  - **Nähe zur sensitiven Strukturen**
  - **“Adherente” Tumor**
- **Rolle der Ablation als cytoreduktive MIT in Patienten mit limitierter Erkrankung oder in symptomatischen Patienten +++**

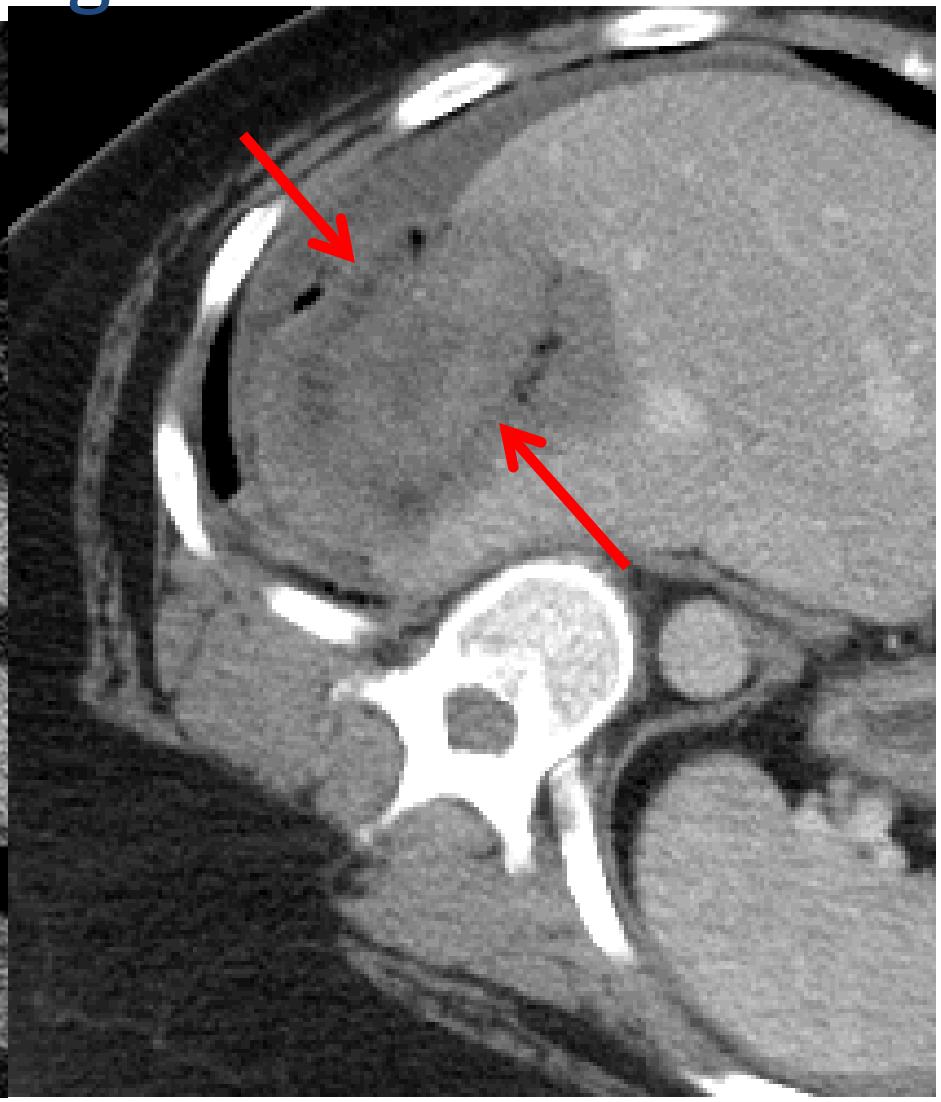
saint 2013

9. Symposium für angewandte interventionsradiologische Techniken

Radiologische Interventionen

Danke für Ihre Aufmerksamkeit !

Symptomatic Hemangioma 8.5 cm



Pre MW

Post MW

Ablation zone=9.2 x 7.7 x 6.6 cm