Results of CRS and HIPEC in Colorectal PSM and Pseudomyxoma Peritonei

K. Van der Speeten

05/10/12

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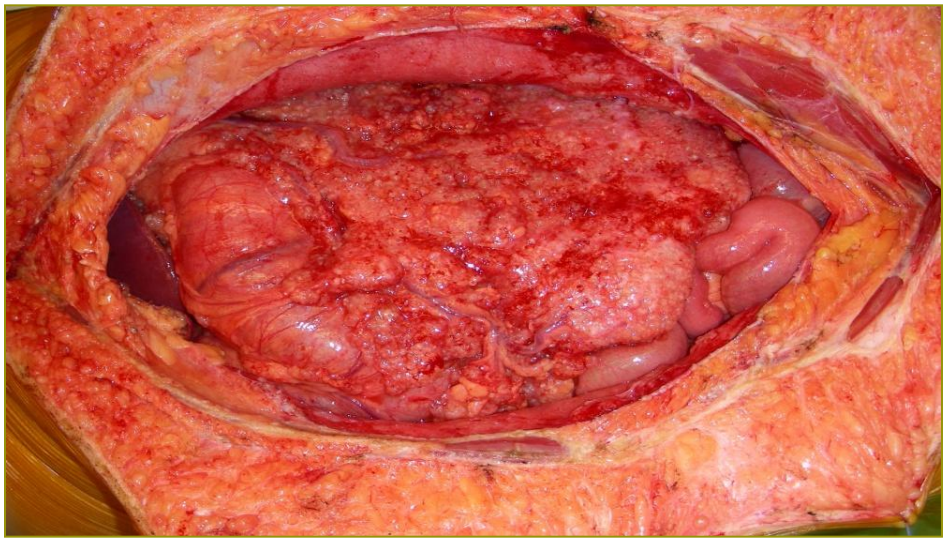
universiteit hasselt

- Introduction
- Results
- Morbidity & Mortality
- ‘Adjuvant’ HIPEC
- Conclusions

Introduction

- PSM is a common manifestation of digestive and gynecologic malignancies alike
- Systemic chemotherapy : no long term survival
- Cytoreductive surgery (CRS) + HIPEC : encouraging clinical results
- Aim : to review outcome and morbidity of CRS + HIPEC in colorectal and appendiceal PSM



RESULTS

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Title: Toward curative treatment of peritoneal carcinomatosis by cytoreductive surgery combined with perioperative intraperitoneal chemotherapy

Authors: Glehen Olivier, Gilly François Noel, Boutitie Florent, Bereder Jean Marc, Quenet François,Sideris Lucas, Mansvelt Baudouin, Lorimier Gérard, Msika Simon, Abboud Karine, Turrini Olivier,Arvieux Catherine, Rat Patrick, Gertsch Philippe, Ferron Gwenael, Meeus Pierre, Brigand Cécile,Marchal Frederic, Tuech Jean Jacques, Pocard Marc, Loungnarath Rasmy, Tasseti Vincent, LermiteEmily, Durand Sylvaine, Kurt Van der Speeten, Elias Dominique and Association Française de Chirurgie

Methods

A retrospective cohort multicentre study was performed in French speaking institutions to evaluate toxicity and principal prognostic factors following cytoreductive surgery and PIC (hyperthermic intraperitoneal chemotherapy (HIPEC) and or early postoperative intraperitoneal chemotherapy (EPIC)) for PC from non-gynaecological malignancies.

Results

The study included 1290 patients from 25 institutions who underwent 1344 procedures between February 1989 and December 2007. HIPEC was performed in 1154 procedures. The principal origins of PC were colorectal adenocarcinoma (N=523), pseudomyxoma peritonei (N=301), gastric adenocarcinoma (N=159), peritoneal mesothelioma (N=88), and appendiceal adenocarcinoma (N=50). Morbidity and mortality rates were 33.6% and 4.1%, respectively. By multivariate analysis, age, extent of PC, and institutional experience had a significant influence on toxicity. The overall median survival was 34 months: 30 months for colorectal PC, not reached for pseudomyxoma peritonei, 9 months for gastric PC, 41 months for peritoneal mesothelioma, and 77 months for PC from appendiceal adenocarcinoma. Independent prognostic indicators by multivariate analysis were the institution, origin of PC, completeness of cytoreductive surgery, extent of carcinomatosis, and lymph node involvement.

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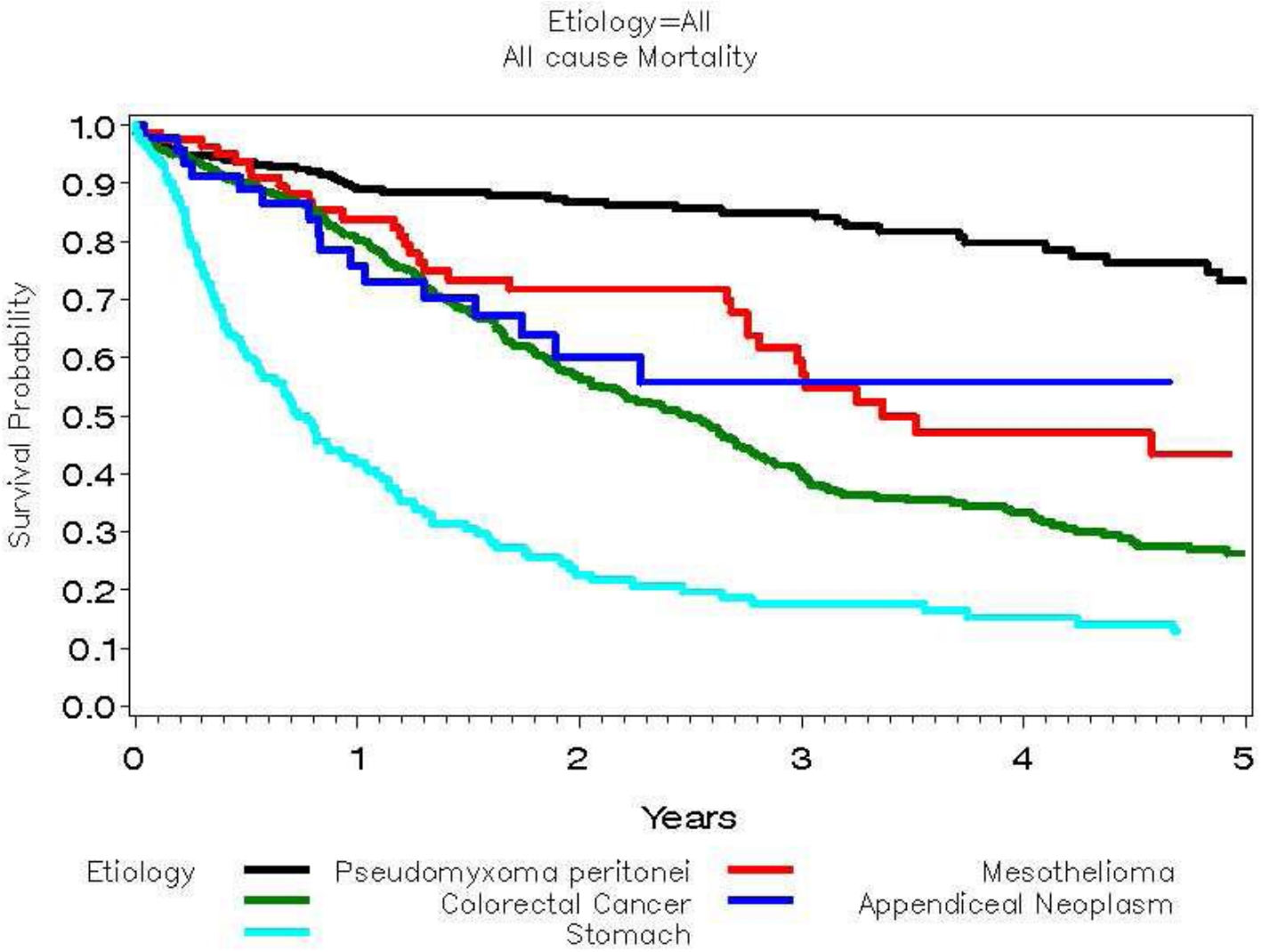
Figure 2 : Overall survival rates for patients with colorectal PC, pseudomyxoma peritonei, peritoneal,mesothelioma, gastric PC, and PC from appendiceal adenocarcinoma.



Pseudomyxoma Peritonei

TABLE 3. Comparison of International Survival Results After Treatment of Pseudomyxoma Peritonei

Series (n)	5 yr OS (%)	10 yr OS (%)	FU (Months)	NED (%)
Traditional treatment				
Gough et al[15] (56)	53	32	144	3
Miner et al[16] (97)	80*	21	57	12
Cytoreduction and (H)IPEC				
Deraco et al[23] (33)	97*	—	29	74
Elias et al[20] (36)	66†	60†‡	48	55
Sugarbaker et al[24] (385)	86*	80*‡	38	62
Güner et al[25] (28)	80*	—	51	—
Loungnarath et al[22] (27)	52†	—	23	—
Moran et al[21] (100)	72*‡	—	30	70
Present study (103)	60†	>50‡	51	56

*Including only patients with complete cytoreduction and/or favorable pathology.
†Including patients with both favorable and unfavorable pathology.
‡Estimated.
OS indicates overall survival; FU, follow-up (both mean and median are used); NED, no evidence of disease at end of follow-up.

COLON CARCINOMA

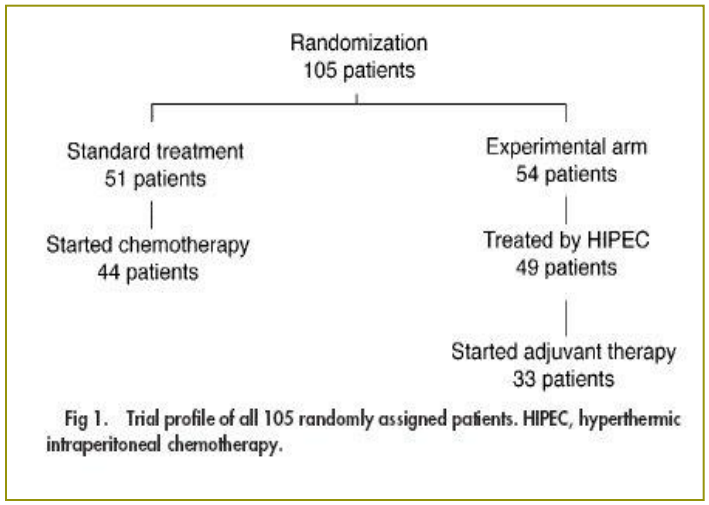


Fig 1. Trial profile of all 105 randomly assigned patients. HIPEC, hyperthermic intraperitoneal chemotherapy.

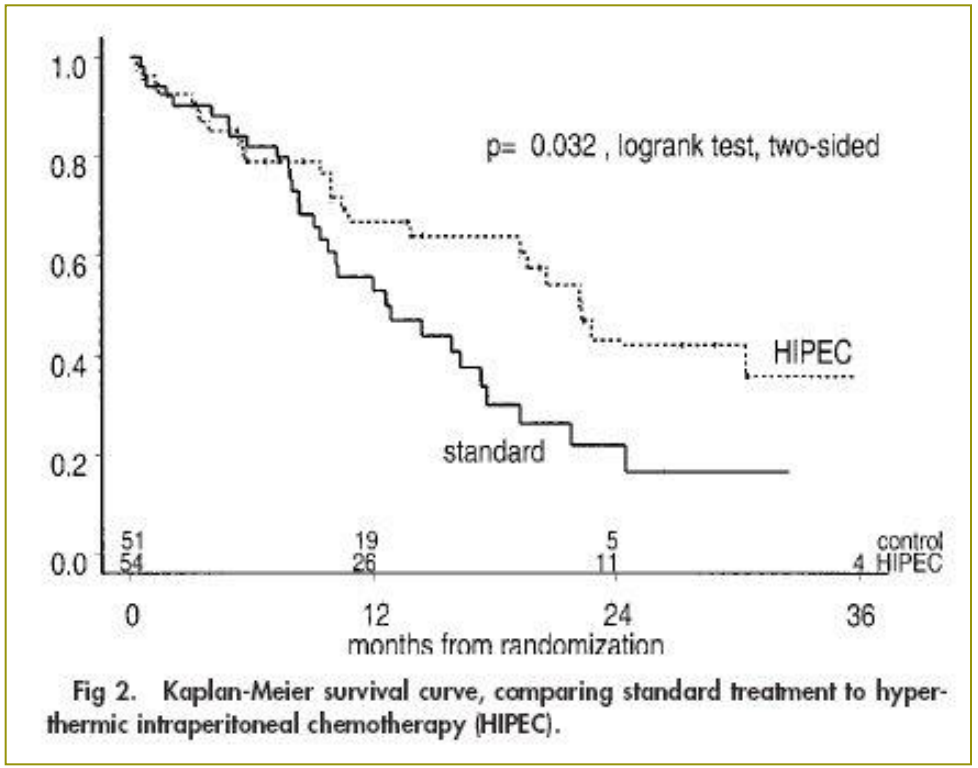


Fig 2. Kaplan-Meier survival curve, comparing standard treatment to hyperthermic intraperitoneal chemotherapy (HIPEC).

COLON CARCINOMA

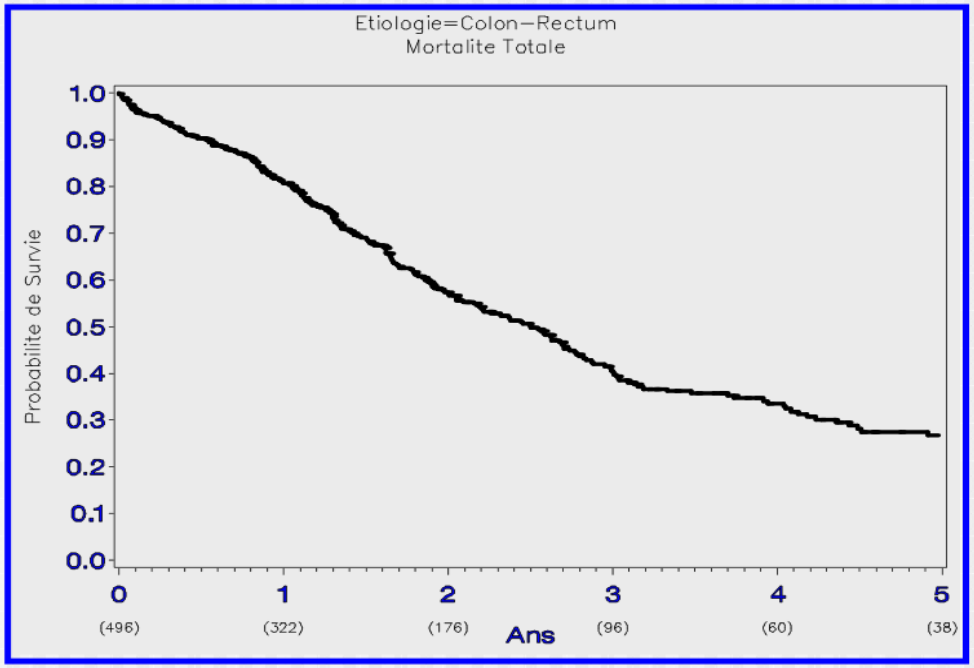
Colon-Rectum

- 523 patients treated in 23 centres
- Mean age: 53 ± 12 years
- 7% came from rectum
- 35% of the PC were synchronous to the du primary
- Complete cytoreductive surgery (CC0) in 85% of the cases
- With HIPEC: 86%, with EPIC: 14%

Courtesy : D. Elias and Olivier Glehen

COLON CARCINOMA

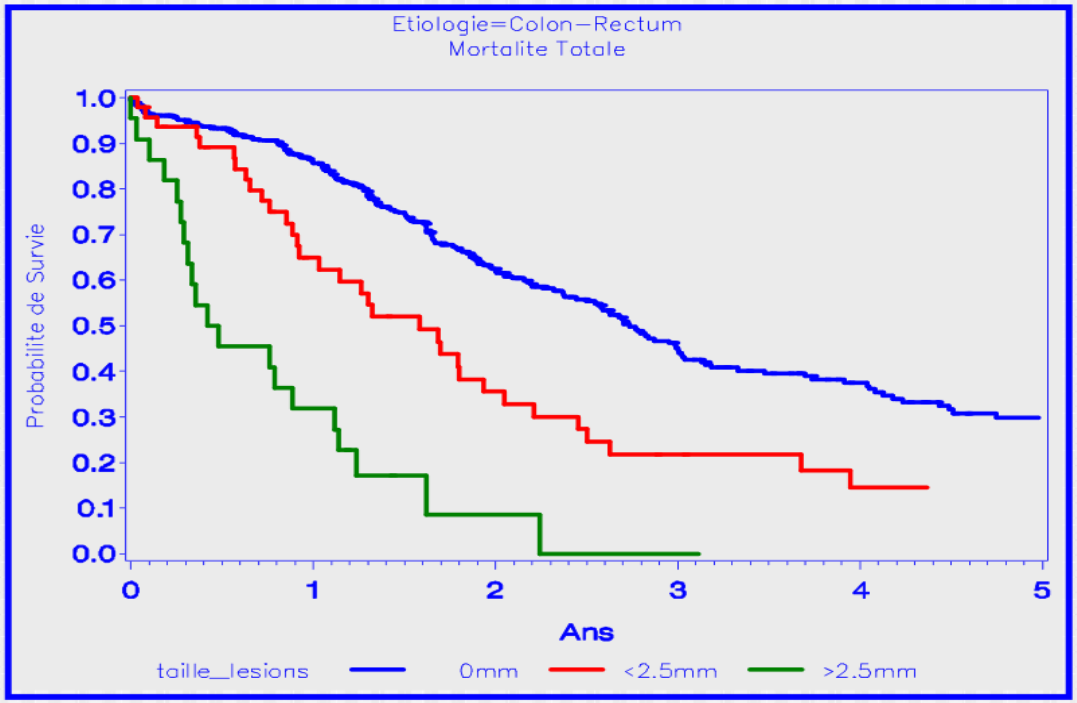
Overall Survival of the 523 patients



Median survival: 30 months **5-years survival: 27%**

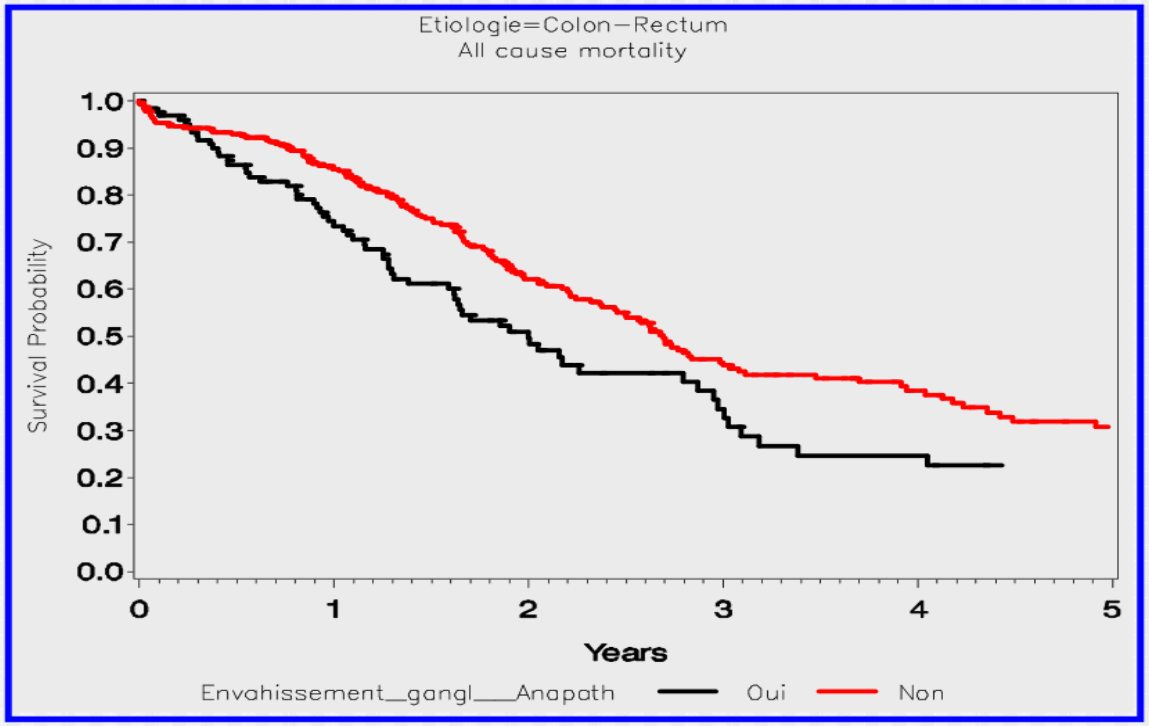
COLON CARCINOMA

Survival according to the Radicality of the Surgery (p< 0.0001)



COLON CARCINOMA

Survival according to the Lymph Node Involvement (n= 125) (p= 0.02)



COLON CARCINOMA

Multivariate study

Variable	p	Relative risk
P. Index	**<0.0001**	**1.052**
Each increasing of one point increases the risk of death of the rapport of risk, i.e. of 5.2%.		
CCR-Status	**0.05**	**1.398**
In three classes: CCR-0, CCR-1, and CCR-2. To pass from one class to another increases of 39.% the risk of death.		
Lymph node	**0.02**	**1.534**
Adjuv. Chemo	**0.002**	**0.578**

COLON CARCINOMA

Survival of the 416 patients of the CC0-Group

Median survival: 33 months

5-years survival: 30%

PERITONEAL CARCINOMATOSIS : AGGRESIVE APPROACH

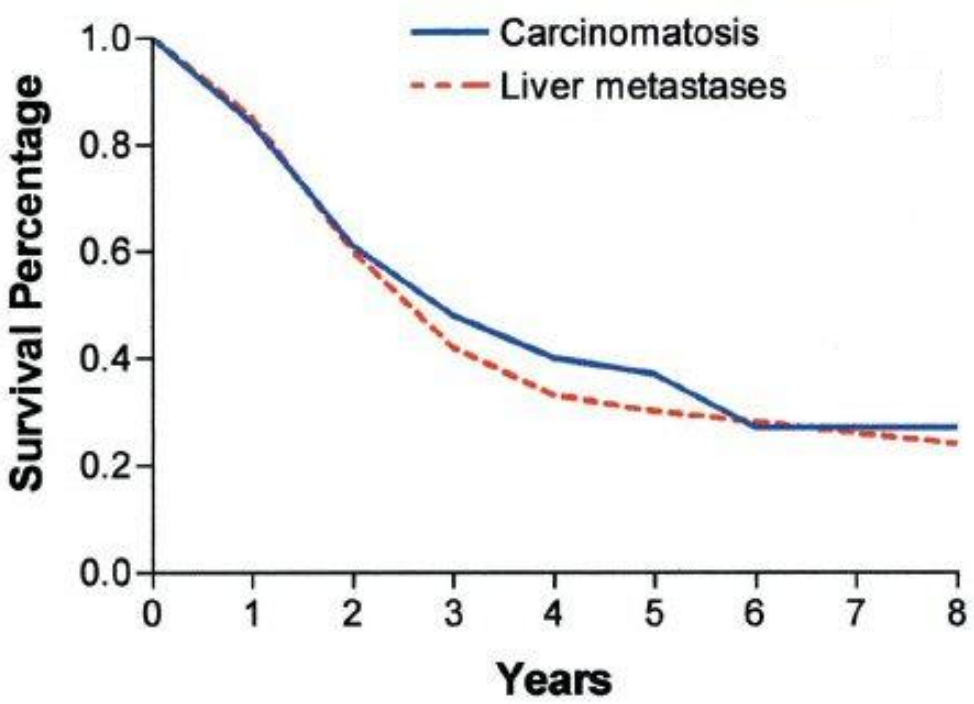


Fig 1. Comparison of survival of a group of patients with colorectal metastases to the liver and a second group with carcinomatosis. In all liver metastases patients[5] the liver resection was scored *R0*; in all the carcinomatosis patients, the cytoreduction was scored as complete.

Journal of Clinical Oncology, Vol 21, No 5 (March 1), 2003: pp 762–764
DOI: 10.1200/JCO.2003.12.071

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Prove it, then improve it : phase III trials ?

When are randomised trials unnecessary?

Glasziou P et al., Brit Med J, Feb 2007

Some historical examples of treatments with DRAMATIC EFFECTS that became standard of care without randomized controlled clinical trials:

- Blood transfusion for shock
- Antibiotics for sepsis
- Tracheostomy for tracheal obstruction
- Suturing for repair of large wounds
- Surgical removal of primary solid cancers
- Combination therapy for testicular cancer
- Surgical resection of 1-3 liver metastases

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Prove it, then improve it : phase III trials ?

Parachute use to prevent death and major trauma related to gravitational challenge: systematic review of randomised controlled trials

Gordon C S Smith, Jill P Pell

Parachutes reduce the risk of injury after gravitational challenge, but their effectiveness has not been proved with randomised controlled trials

What is already known about this topic

Parachutes are widely used to prevent death and major injury after gravitational challenge

Parachute use is associated with adverse effects due to failure of the intervention and iatrogenic injury

Studies of free fall do not show 100% mortality

What this study adds

No randomised controlled trials of parachute use have been undertaken

The basis for parachute use is purely observational, and its apparent efficacy could potentially be explained by a "healthy cohort" effect

Individuals who insist that all interventions need to be validated by a randomised controlled trial need to come down to earth with a bump

M & M

Incidence

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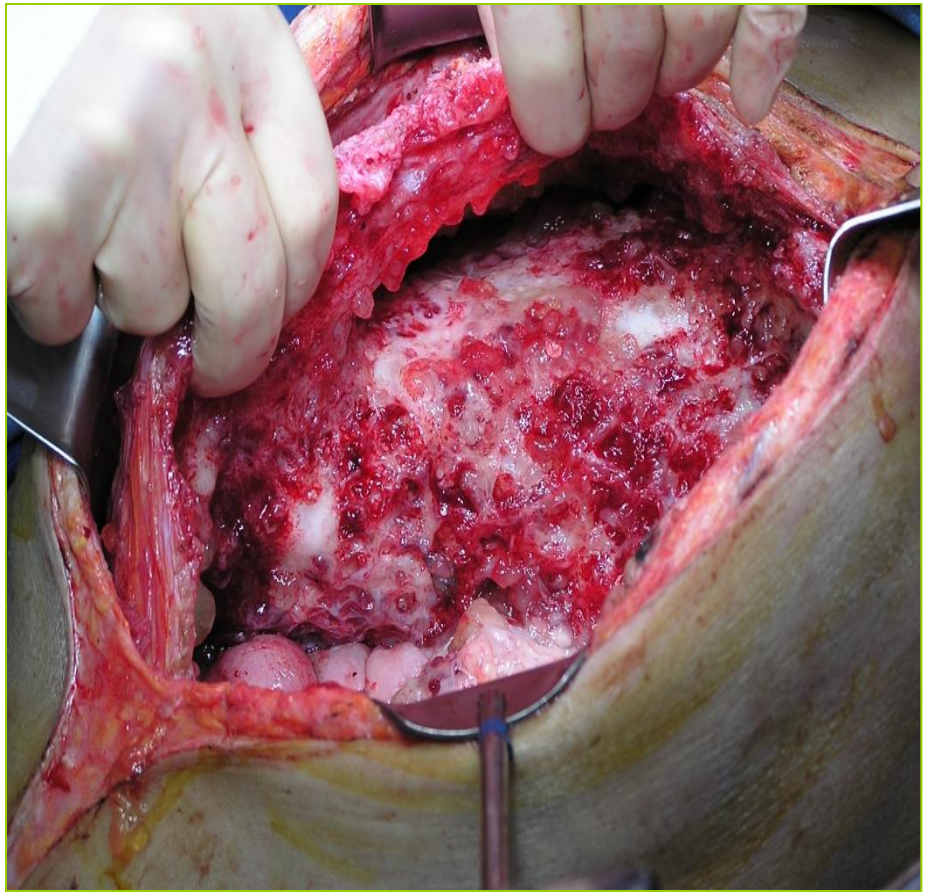

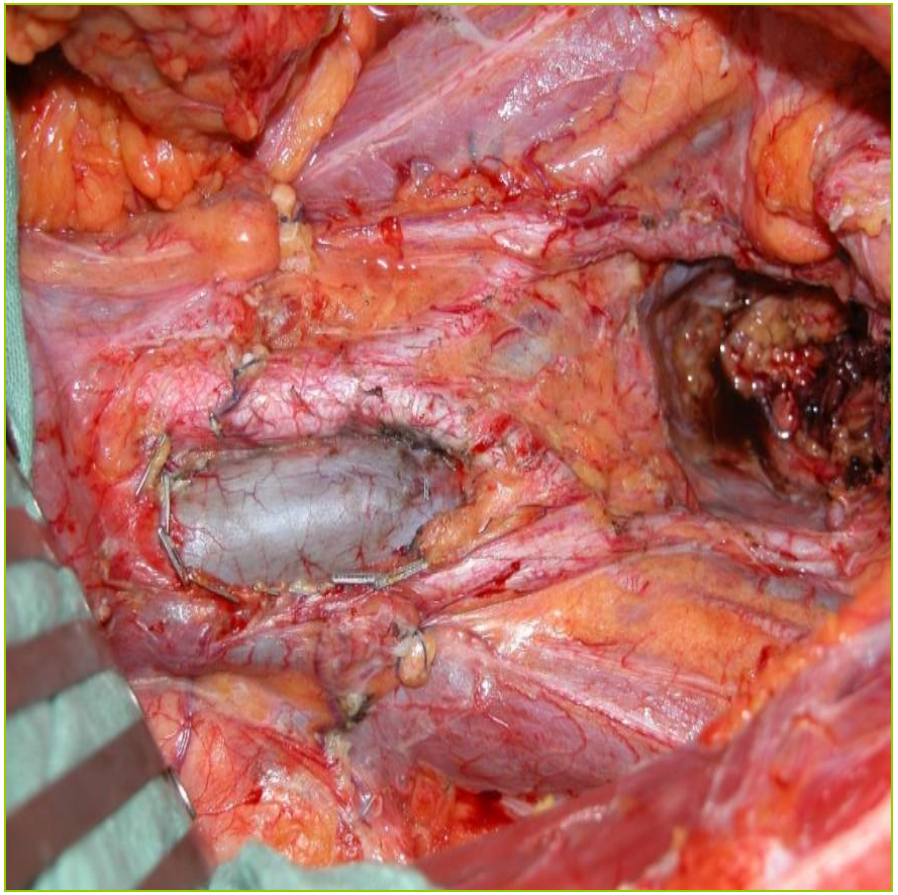

TABLE 5. Perioperative Factors and Mortality Outcomes of 24 Institutions Following Cytoreductive Surgery and Perioperative Intraperitoneal Chemotherapy

First Author	Mean Length of Hospital Stay (d)	Mean Length of ICU Stay (d)	Treatment Related Deaths (n)	Mortality (%)	Causes
Glehen et al[8]	11.8	NR	7	3.2	Septic shock, peritonitis, pulmonary embolism, multi-organ failure, aplasia, myocardial necrosis, acute renal failure
Ahmad et al[9]	11*	NR	0	0	—
Schmidt et al[10]	25*	5*	3	4.5	Peritonitis, pneumonia, sepsis from bone marrow toxicity
Kecmanovic et al[11]	14.2	NR	0	0	—
Yonemura et al[12]	NR	NR	3	2.8	Renal failure, multi-organ failure, and bleeding
Rufian et al[13]	11*	NR	0	0	—
Kusamura et al[14]	23	3	2	0.9	Duodenal perforation, colic perforation, and sepsis
Sugarbaker et al[15]	21*	NR	7	2	Systemic inflammatory response, fistula, unknown (3), pulmonary embolus, neutropenia
Roviello et al[16]	29	NR	1	1.6	Multiorgan failure
Zanon et al[17]	NR	NR	1	4	Pulmonary embolus
Cavaliere et al[18]	NR	NR	4	3.3	NR
Tuttle et al[19]	9*	NR	0	0	—
Capone et al[20]	48*	NR	5	17	NR
Elias et al[21]	24	NR	4	4	Postinhalation lung infection (3), ischaemic gut
Levine et al[22]	15	2	22	4.4	Wound infection, haematologic toxicity, sepsis, respiratory failure, anastomotic leak, pneumonia, enterocutaneous fistula
Smeenk et al[23]	17*	NR	18	5.8	NR
Kianmanesh et al[24]	27	NR	1	2.3	NR
Helm et al[25]	11.5	NR	1	6	Pulmonary embolus
Gusani et al[26]	12*	3*	2	1.6	Unknown, died of the malignancy
van Leeuwen et al[27]	15*	1*	1	1	Cerebral infarction
Di Giorgio et al[28]	22	2	2	4	Pulmonary embolus (2)
Harrison et al[29]	7	NR	0	0	—
Ceelen et al[30]	19*	3*	0	0	—
Morris†	31	5	5	2	Sepsis and multiorgan failure (5)
Range	7–48	1–5	0–22	0–17	—
Mean	19	3	3.7	2.9	—

*Refers to median.
†Unpublished data.

TABLE 6. Perioperative Morbidity Outcomes of 24 Institutions Following Cytoreductive Surgery and Perioperative Intraperitoneal Chemotherapy

First Author	Combined Major or Grade III/IV Morbidity (%)	Re-Operation (%)	Sepsis (%)	Fistula (%)	Abscess (%)	Hematological Toxicity (%)	Ileus (%)	Renal Insufficiency (%)	Perforation (%)	DVT/PE (%)	Anastomotic Leak (%)
Glehen et al[8]	25	NR	3	7	7	5	5	1	1	3	NR
Ahmad et al[9]	26	6	0	9	9	0	2	0	3	3	0
Schmidt et al[10]	NR	22	6	7	7	3	0	2	2	0	9
Kecmanovic et al[11]	0	0	0	0	0	11	17	0	0	0	0
Yonemura et al[12]	NR	NR	—	1	6	—	—	2	2	—	6
Rufian et al[13]	36	6	0	0	0	0	3	0	3	0	0
Kusamura et al[14]	12	NR	2	1	NR	1	2	NR	3	0.5	8
Sugarbaker et al[15]	14	11	NR	2	1	NR	NR	NR	NR	2	2
Roviello et al[16]	28	8	0	9	3	9	2	3	NR	0	NR
Zanon et al[17]	NR	8	0	0	0	0	0	4	0	0	8
Cavaliere et al[18]	23	NR	NR	NR	NR	20	NR	NR	5	NR	3
Tuttle et al[19]	NR	0	0	11	11	0	0	0	0	9	0
Capone et al[20]	27	NR	NR	NR	17	NR	10	7	10	NR	7
Elias et al[21]	52	23	NR	23	8	11	86	3	0	NR	0
Levine et al[22]	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Smeenk et al[23]	51	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Kianmanesh et al[24]	NR	5	NR	9	14	NR	14	7	NR	NR	NR
Helm et al[25]	NR	22	11	6	6	28	0	0	0	6	0
Gusani et al[26]	30	NR	4	2	4	NR	NR	NR	0	2	7
van Leeuwen et al[27]	43	18	8	5	9	7	2	0	3	2	4
Di Giorgio et al[28]	26	13	0	9	0	0	0	0	0	2	0
Harrison et al[29]	NR	NR	0	0	5	0	10	0	0	0	5
Ceelen et al[30]	24	10	0	0	0	0	0	0	4	0	4
Morris*	43	16	14	13	37	0	8	1	5	3	NR
Range	0–52	0–23	0–14	0–23	0–37	0–28	0–86	0–7	0–10	0–9	0–9
Mean	28.8	11.2	3	5.7	7.2	5.6	9.5	1.7	2.2	1.9	3.5

*Unpublished data.

Positioning

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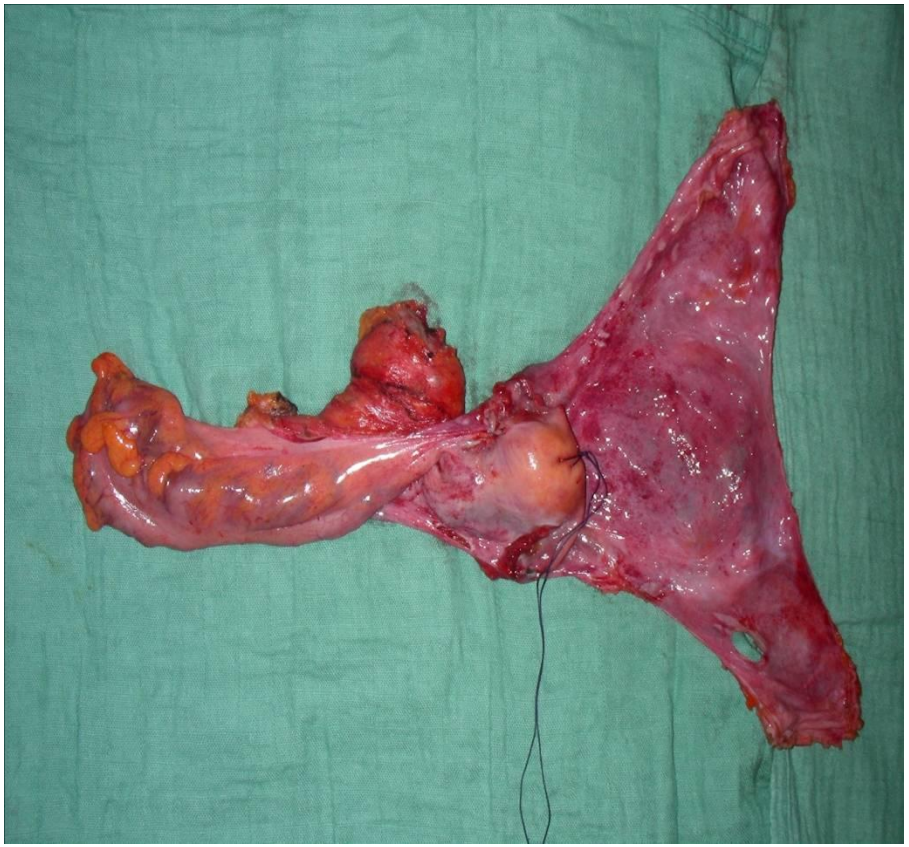
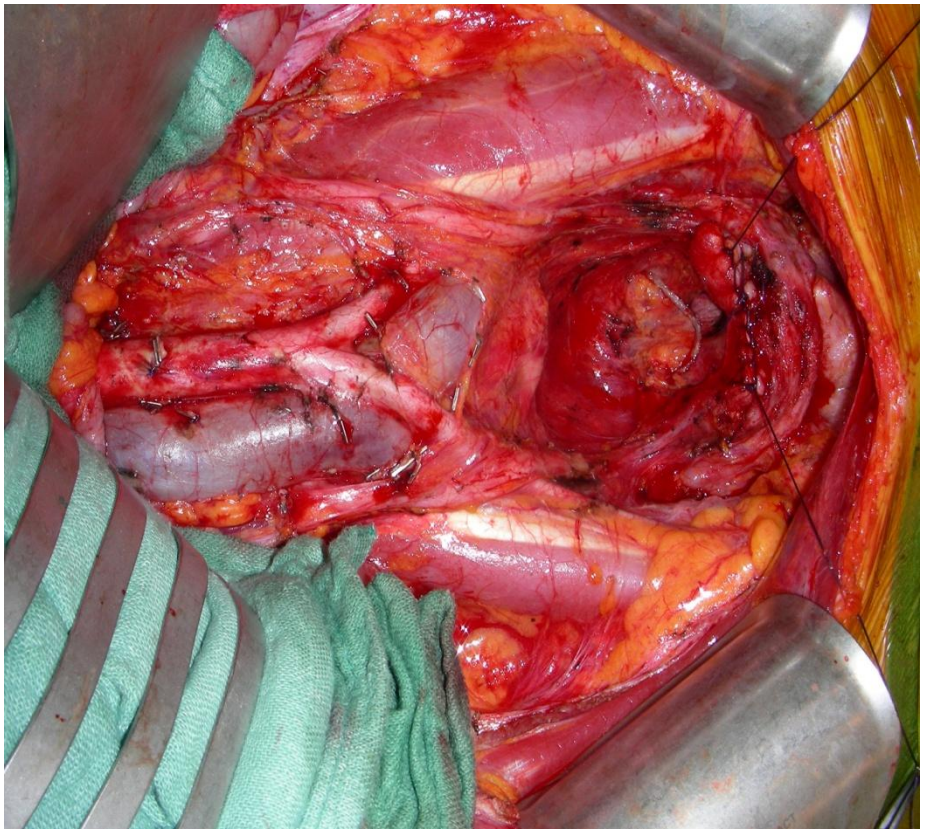
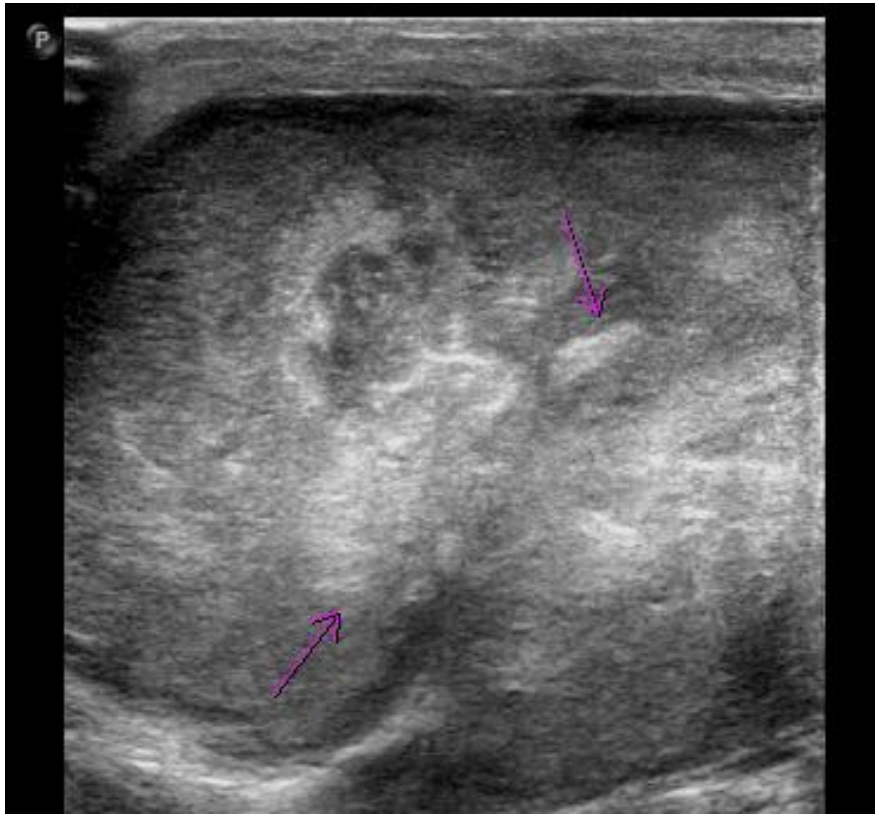
CASE-REPORT

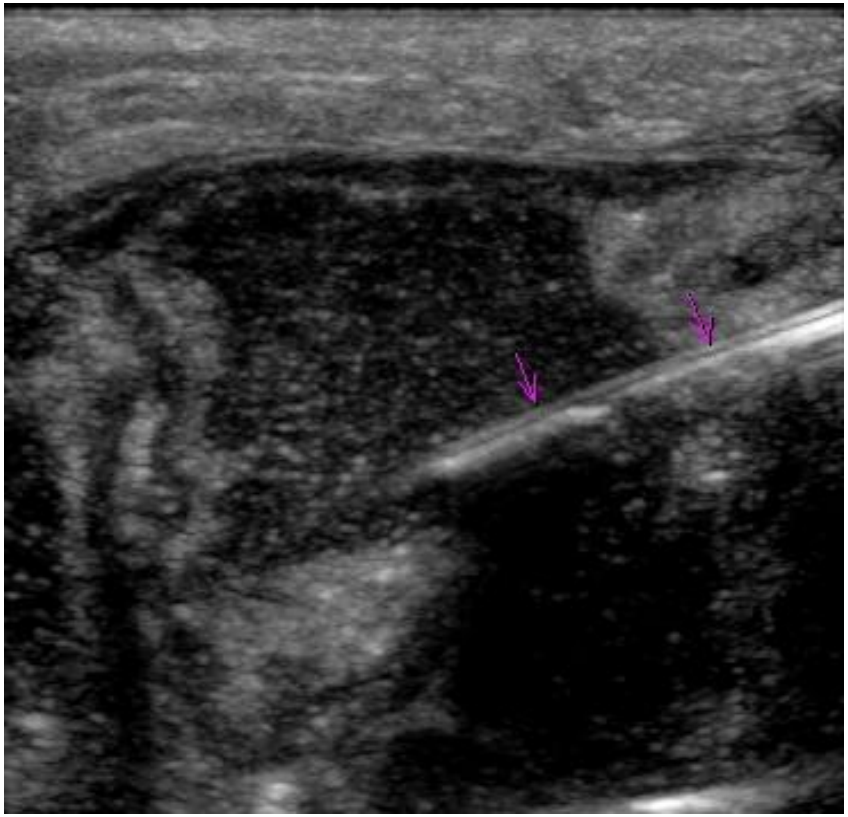




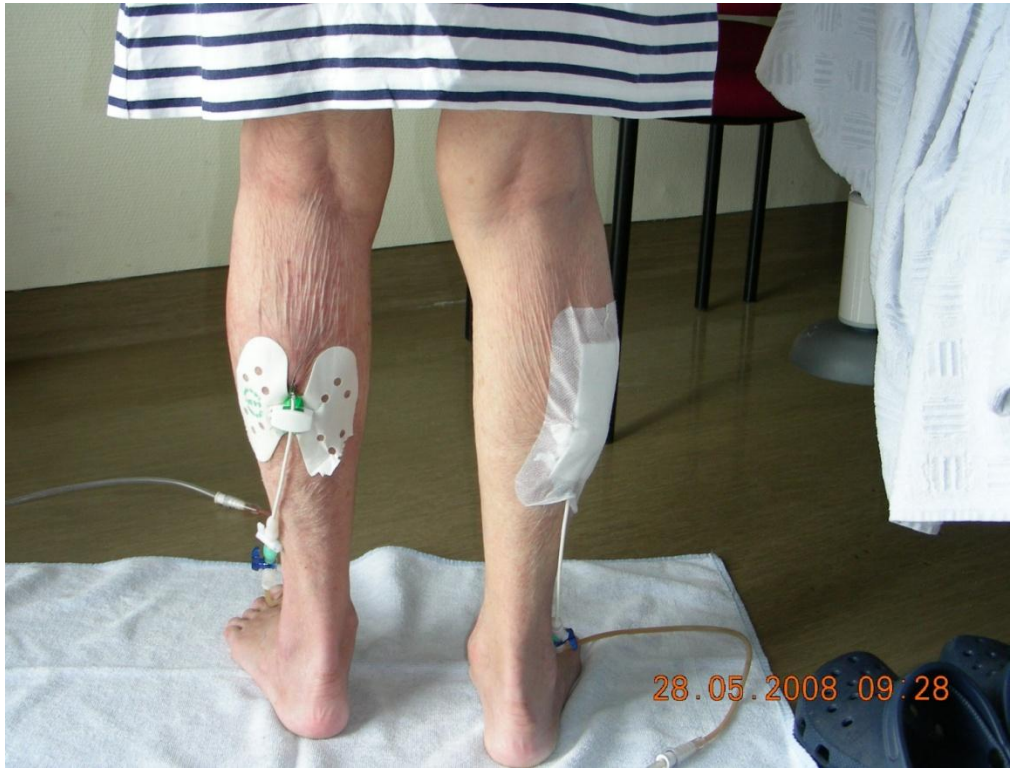
AVC, 54 yrs, ovarian PC, OVHIPEC Trial protocol, CC1 cytoreduction

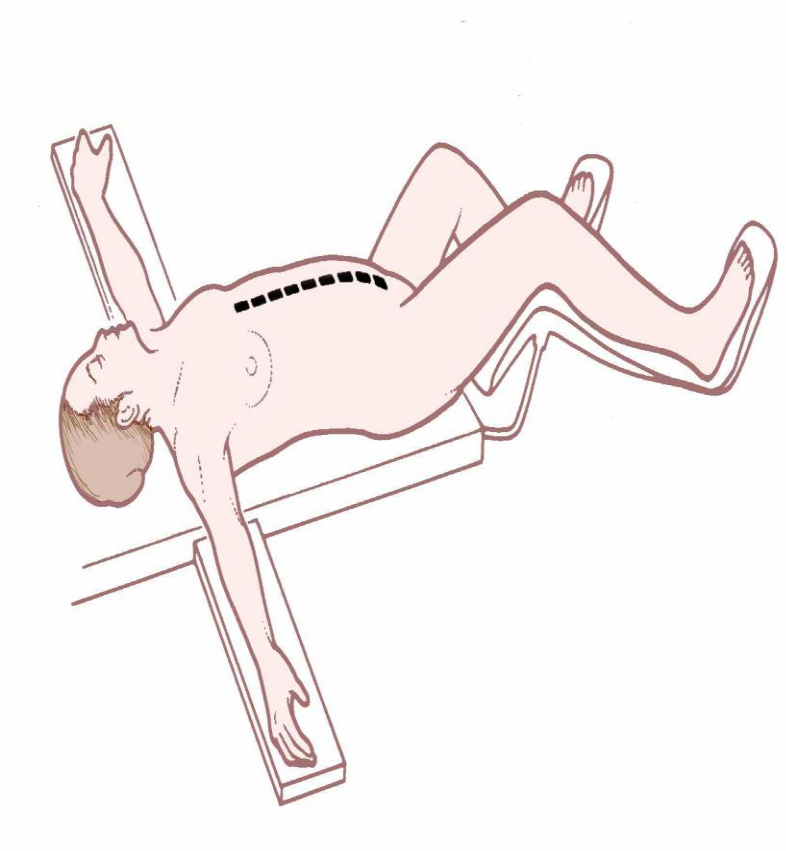
CASE-REPORT





CASE-REPORT





- **Do the positioning yourself**
- **Modified ‘modified’ lithotomy position**
- **Regular pausing of the pneumatic compression stockings**

Anesthetic pitfalls

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SEVERE HYPONATREMIA, HYPERGLYCEMIA, AND HYPERLACTATEMIA ARE ASSOCIATED WITH INTRAOPERATIVE HYPERTHERMIC INTRAPERITONEAL CHEMOPERFUSION WITH OXALIPLATIN

Filip De Somer,[1] Wim Ceelen,[2] Joris Delanghe,[3] Dirk De Smet,[1]
Martin Vanackere,[1] Piet Pattyn,[2] and Eric Mortier[4]

Departments of Cardiac Surgery,[1] Abdominal Surgery,[2] Central Laboratory,[3] and Anaesthesia,[4] University Hospital Ghent, Ghent, Belgium

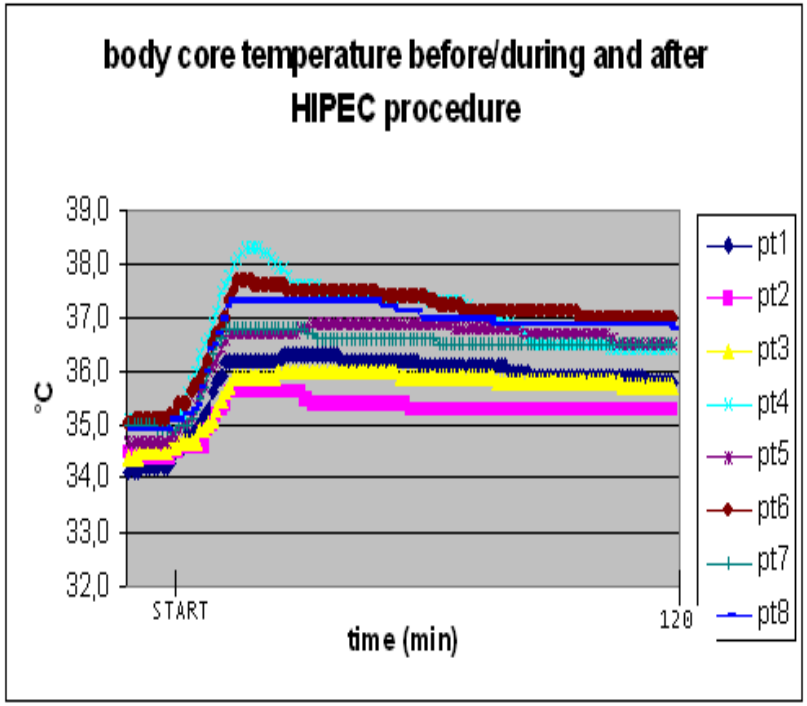
CASE REPORT

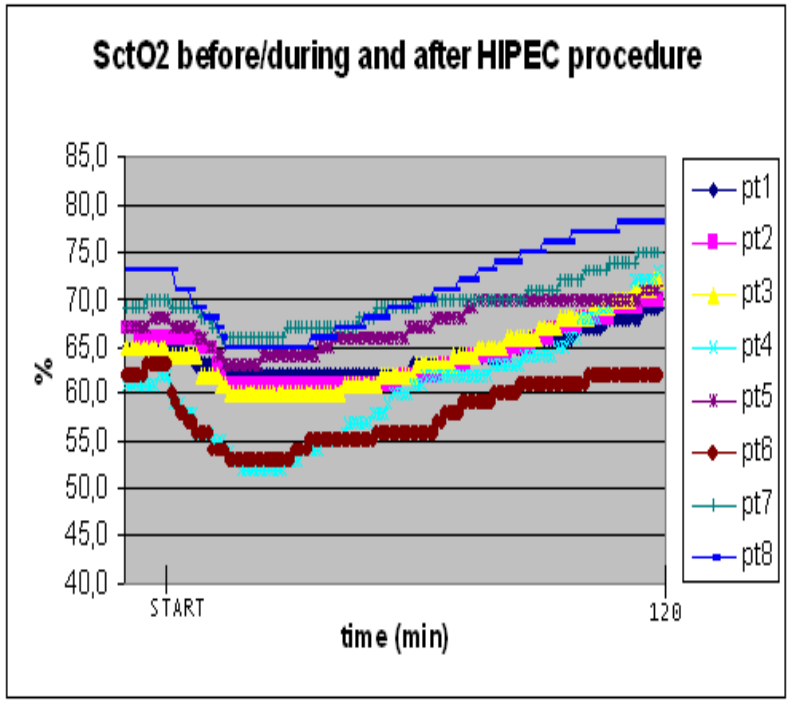
Ventricular tachycardia during hyperthermic intraperitoneal chemotherapy

C. A. Thix,[1] I. Königsrainer,[2] R. Kind,[3] P. Wied[1] and T. H. Schroeder[1]

1 Department of Anaesthesiology and Critical Care Medicine, 2 Department of General, Visceral, and Transplantation Surgery, 3 Maquet Cardiovascular at the Department of Cardiothoracic and Vascular Surgery, Tuebingen University Hospital, Tuebingen, Germany

MONITORING OF BRAIN OXYGENATION DURING HYPERTHERMIC INTRAPERITONEAL CHEMOTHERAPY (HIPEC) PROCEDURES

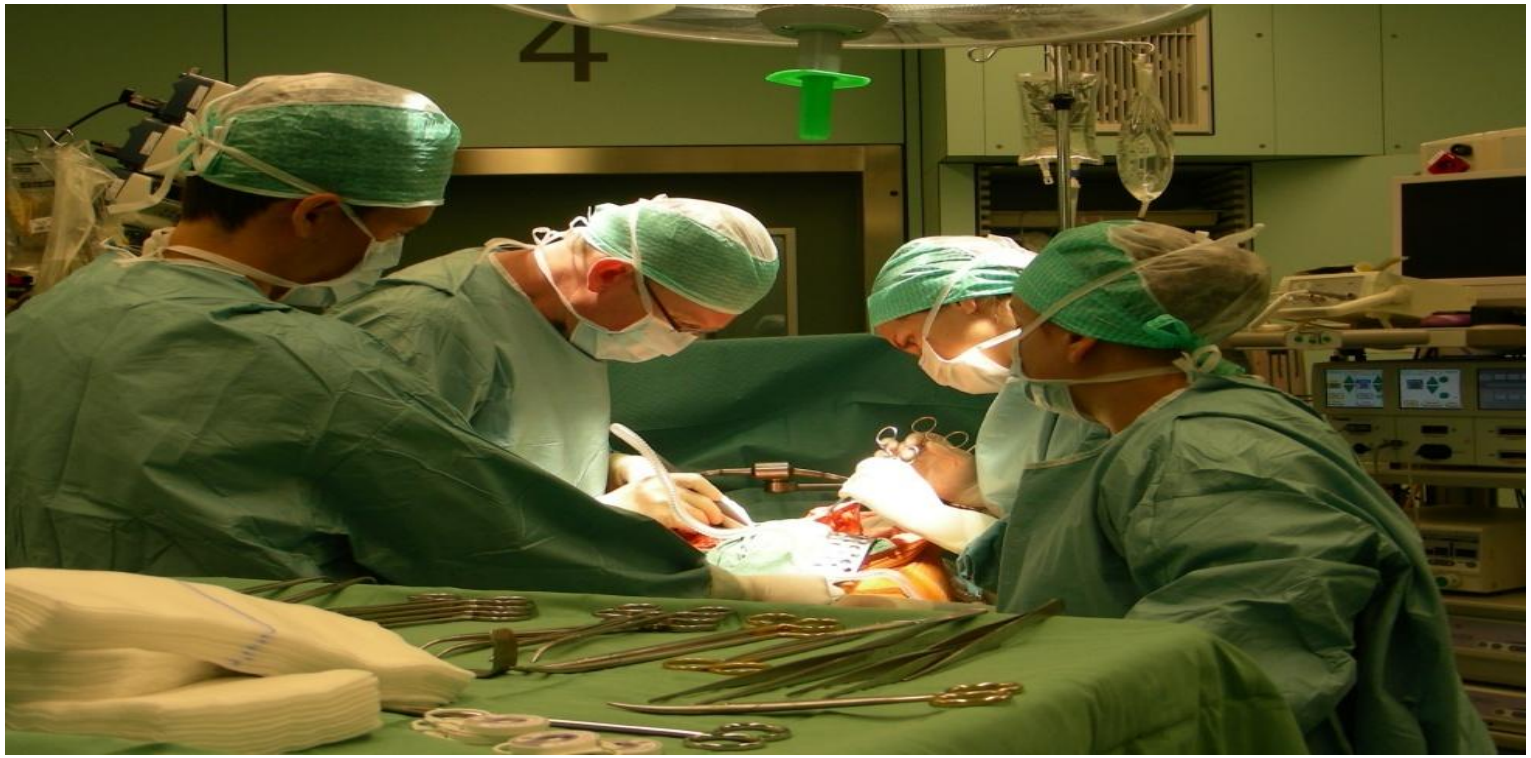




CONCLUSIONS

This is the preliminary report on non-invasive, absolute cerebral oxygenation monitoring during HIPEC procedures, where rapid increase in body temperature may be induced. These rapid increases in body temperature may result in mismatches in cerebral perfusion to cerebral metabolism ratio, possible inducing inadequacy of cerebral perfusion. However, more data are required to elucidate the relationship between rapid increases in body temperature and adequacy of cerebral perfusion, as monitored by cerebral oximetry.

Eur J Anaesthesiol 2009; 26 (Suppl 45): 44.

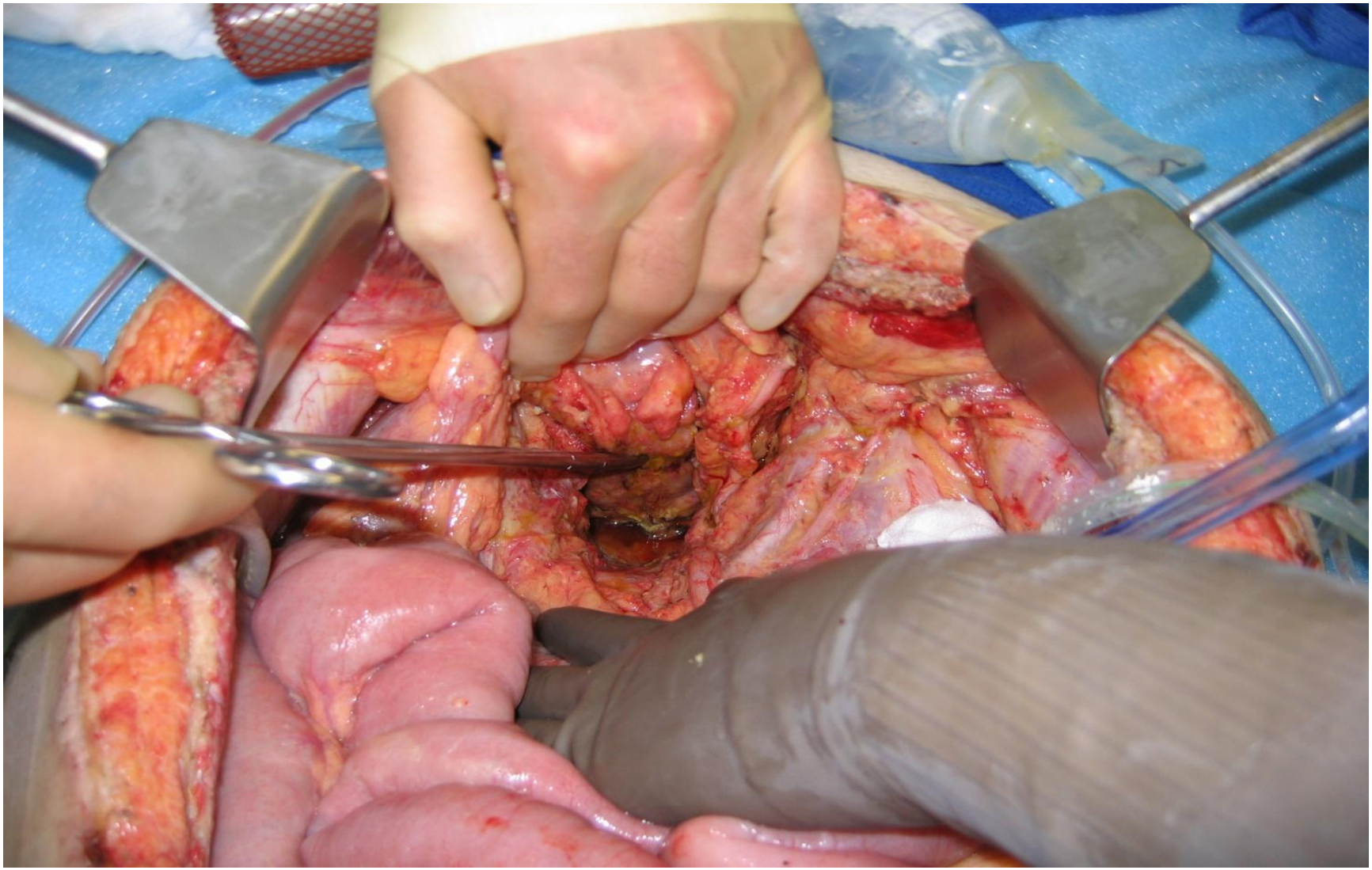


- proper training of anesthesiologists is mandatory
- Train the whole team !!!

Anastomotic

Leaks

CASE-REPORT



Hyperthermic intraperitoneal chemoperfusion (HIPEC) decrease wound strength of colonic anastomosis in a rat model

J. O. W. Pelz · J. Doerfer · M. Decker · A. Dimmler · W. Hohenberger · T. Meyer

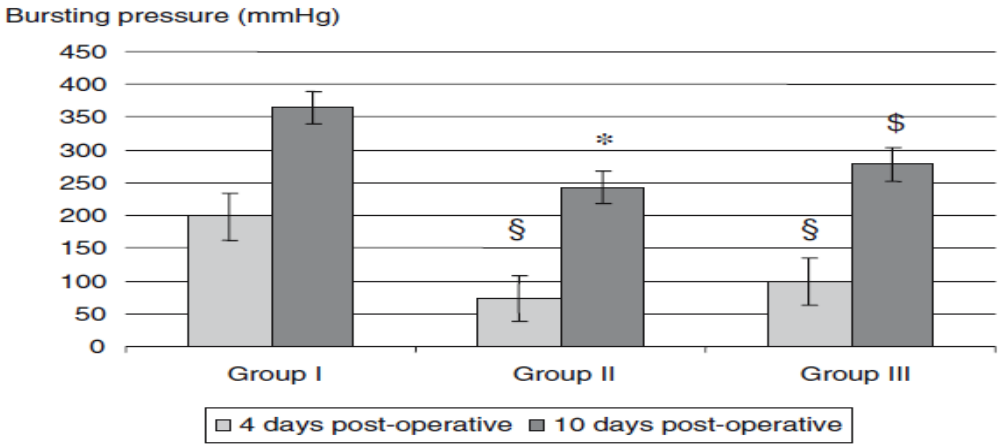


Fig. 1 Anastomotic strength post-operatively. The median are given for bursting pressure. (Group I: control without treatment; group II: anastomosis was performed before HIPEC; group III: anastomosis was performed before HIPEC) (§: group III vs group I, $p=0.028$; *: group II vs group I, $p=0.03$; $: group II and group III vs group I, $p=0.24$; Kruskal–Wallis)

Int J Colorectal Dis 2007; 22(8):941-7

Cytoreductive Procedures—Strategies to Reduce Postoperative Morbidity and Management of Surgical Complications With Special Emphasis on Anastomotic Leaks

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TABLE III. Synopsis of Treatment Options of Anastomotic Leaks After Multivisceral Resections in Peritonectomy and HIPEC

Anastomotic leak	1st treatment option	2nd treatment option
Esophago-jejunostomy	Conservatively; interventional therapy of subphrenic abscess	Resection of the anastomosis
Gastro-jejunostomy	Resection and new anastomosis	Oversewing
Duodenal stump	Oversewing, Rouy-en-Y anastomosis	Interventional therapy
Small bowl	Resection and new anastomosis	Fistula development
Colon anastomosis	Diversion operation	Resection and new anastomosis, eventually percutaneous drainage
Rectal anastomosis	Diversion operation	New anastomosis percutaneous/transabdominal drainage VAC therapy

- **Protect all low rectal anastomoses**
- **More than 2 anastomoses: protect**
- **Aggressive treatment of all leakage**

J. Surg. Oncol. 2009;100:302–305.

Hematologic toxicity

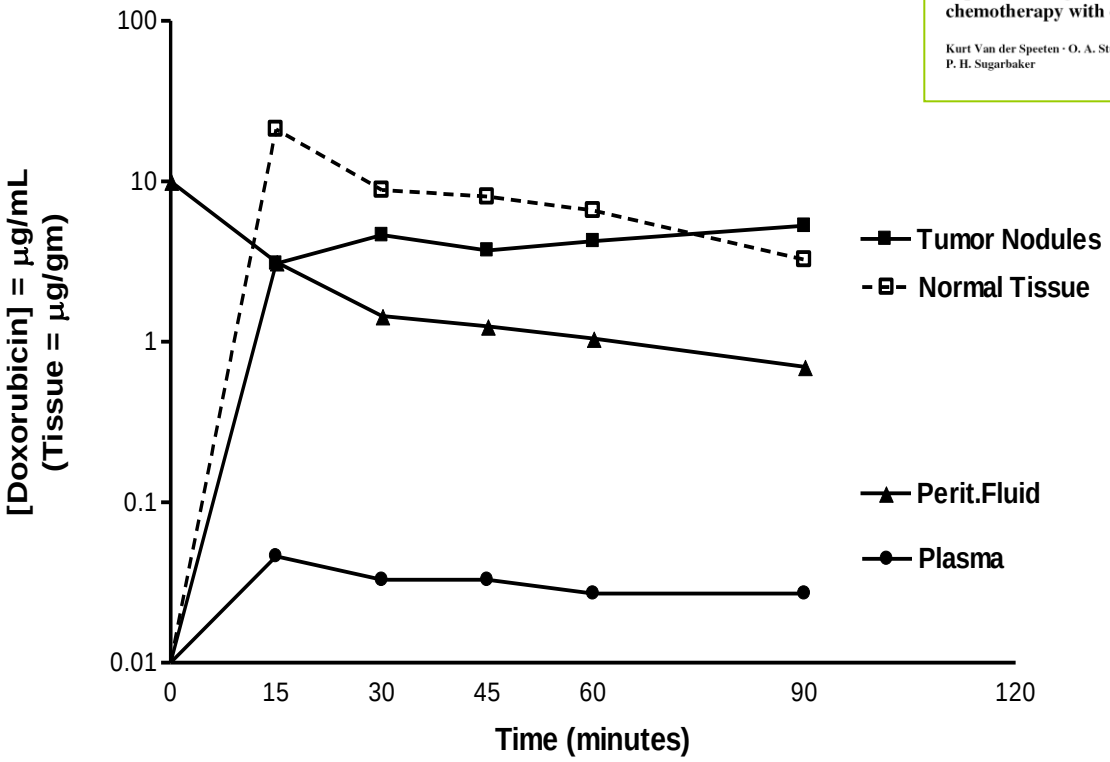
Efficacy versus hematological toxicity

Cancer Chemother Pharmacol
DOI 10.1007/s00280-008-0800-0

ORIGINAL ARTICLE

A pharmacologic analysis of intraoperative intracavitary cancer chemotherapy with doxorubicin

Kurt Van der Speeten · O. A. Stuart · H. Mahteme · P. H. Sugarbaker



Efficacy

Hematological Toxicity

Doxorubicin levels in tumor nodules versus normal adjacent tissues

Incidence of Neutropenia

- 50 patients with peritoneal carcinomatosis from appendiceal cancer were included in this study.

- 10 of 50 patients (20%) were diagnosed with post operative neutropenia. (5 females & 5 males)

- Neutropenia grades based on CTC criteria

  Nadir ANC on post-op day 10($\pm$4).

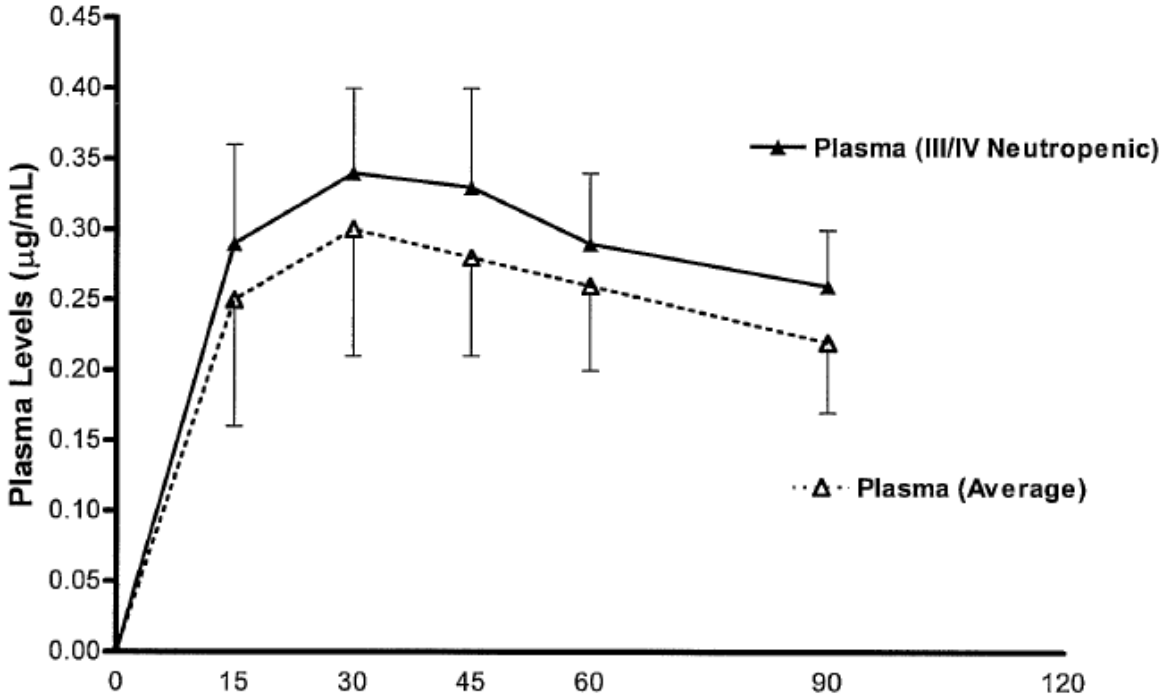
  6 patients (4F & 2M) had a Nadir ANC $\leq 500/mm^3$ (grade IV)

  1 patient (F) had a Nadir ANC = $900/mm^3$ (grade III)

  3 patients (M) had a Nadir ANC = $1000\text{-}2000/mm^3$ (grade I/II)

Unpublished data

BI-DIRECTIONAL INTRAOPERATIVE CHEMOTHERAPY
MITOMYCIN C PLASMA LEVELS
(Grade III/IV Neutropenic Patients vs Average)

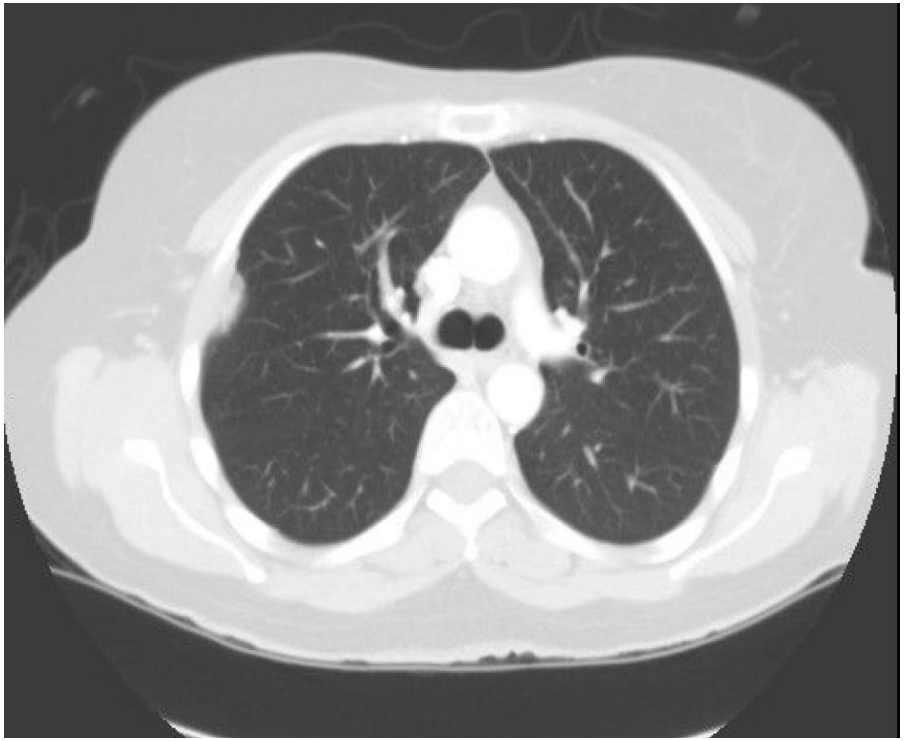


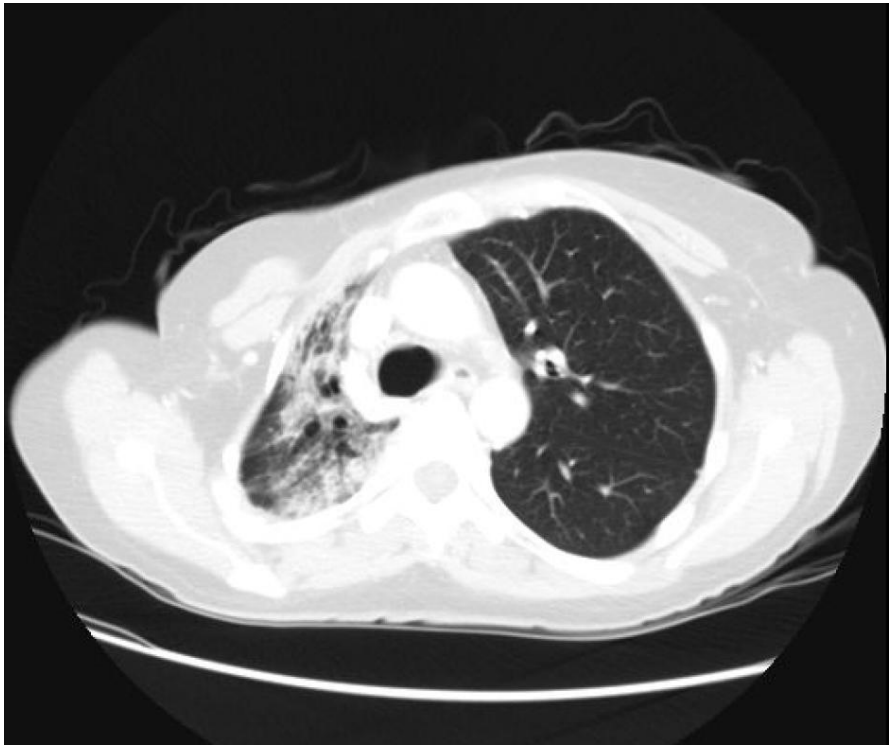
Peak [PL] = 0.35(±0.07)μg/mL (neutropenic)
Peak [PL] = 0.31(±0.09) μg/mL (average)

Unpublished data

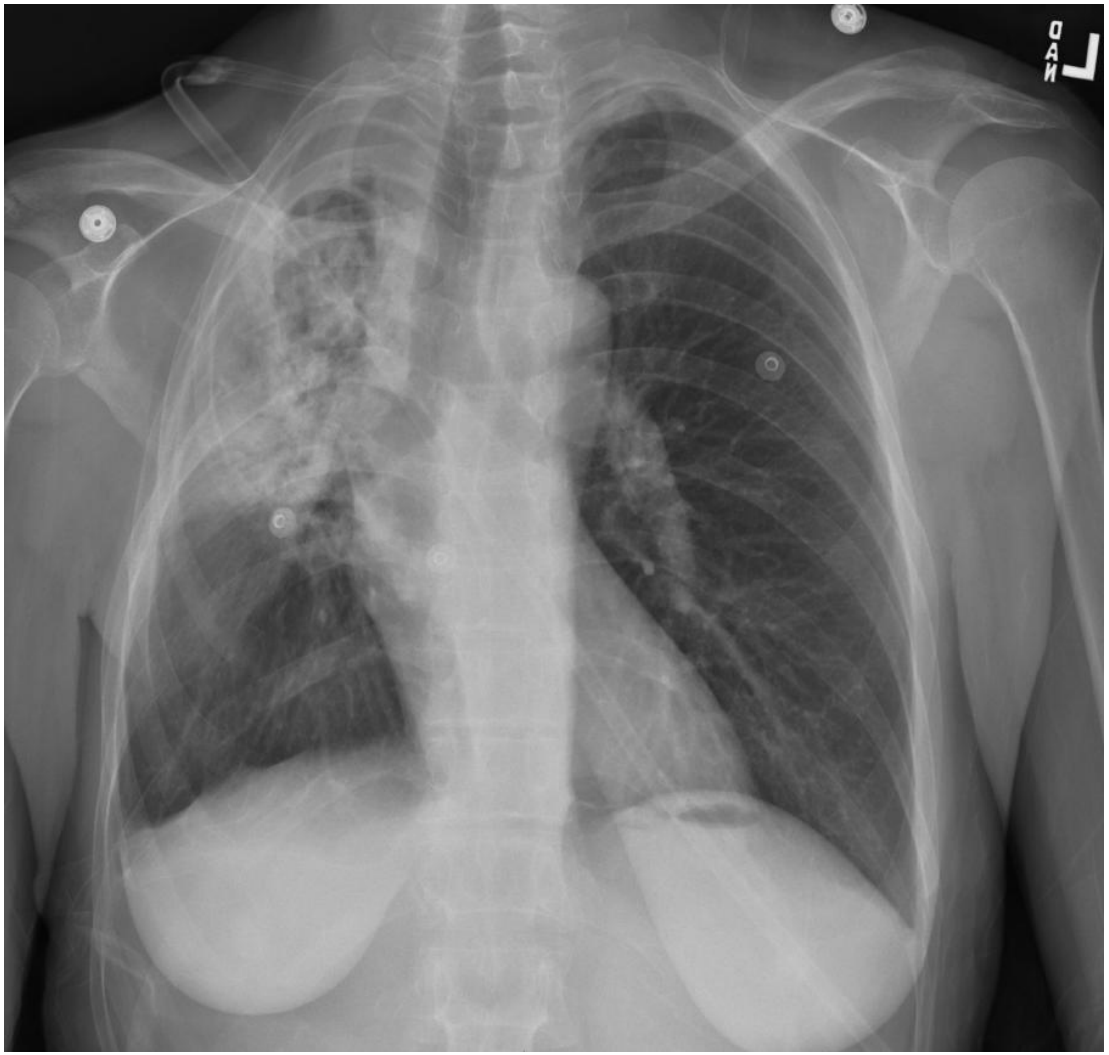
Pulmonary toxicity

CASE-REPORT





CASE-REPORT



M & M

Learning curve

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Learning Curve in Cytoreductive Surgery and Hyperthermic Intraperitoneal Chemotherapy

BIJAN N. MORADI III, MS AND JESUS ESQUIVEL, MD, FACS*
St. Agnes Hospital, Baltimore, Maryland

TABLE I. Overview of Studies Done on the Learning Curve of CRS With PIC

Refs.	Study design	Comparison groups, year range, number of patients (n)	Factors analyzed	Number of surgeons (n)	Same surgical team	Conclusions, learning curve?
Smeenk et al. [3]	Retrospective	Group 1 = 1996–1998 (n = 73); Group 2 = 1999–2002 (n = 121); Group 3 = 2003–2006 (n = 129)	Number of abdominal regions affected, Simplified Peritoneal Cancer Index Score, completeness of cytoreduction, morbidity, duration of hospital stay, and survival	2	Yes	Yes, the zenith of the curve being reached after 130 procedures and reflecting patient selection and treatment expertise
Yan et al. [6]	Retrospective	Group 1 = 1997–2004 (n = 70); Group 2 = 2004–2006 (n = 70)	Perioperative morbidity, delayed morbidity, perioperative mortality, transfusion requirement, length of operation, length of hospital stay, and 2-year survival	1	Yes	Yes, it is improved after 70 cases and addresses that there is a need for concentration of services
Cavaliere et al. [8]	Retrospective	n = 37	Completeness of cytoreduction, length of surgery, and 2-year survival	2	Yes	Yes, the zenith occurs after 19 months of conducting CRS with HIPEC
Moran [7]	Retrospective	Group 1 = 1994–2000 (n = 33); Group 2 = 2000–2002 (n = 33); Group 3 = 2002–2002 (n = 34)	Completeness of cytoreduction, major morbidity, and perioperative mortality	1	Yes	Yes, main components are decision-making and technical factors. Can be reduced by team work and two surgeons

CRS, cytoreductive surgery; PIC, perioperative intraperitoneal chemotherapy; HIPEC, hyperthermic intraperitoneal chemotherapy.

- **Don't reinvent the wheel; 'surf' on the global learning curve**

Journal of Surgical Oncology 2009;100:293–296

Why should we move CRS and HIPEC up in the treatment line of colorectal and appendiceal cancer

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- Fact I : Risk factors for PC
- Fact II : Low volume PC; best outcome
- Fact III : Low volume PC; low M&M
- Surgical strategies in patients at risk

FACT I

Risk Factors for PC

Fact I : Risk factors for PC

- **Tumor Perforation**
- Positive Cytology
- Mucinous Tumors
- T4 Tumors
- Obstruction

TUMOR PERFORATION

Incidence, Patterns of Failure, and Prognosis of Perforated Colorectal Cancers in a Well-Defined Population

Nicolas Cheynel, M.D., Ph.D. • Marion Cortet • Côme Lepage, M.D., Ph.D.
Pablo Ortega-Debalon, M.D., Ph.D. • Jean Faivre, M.D., Ph.D.
Anne-Marie Bouvier, M.D., Ph.D.

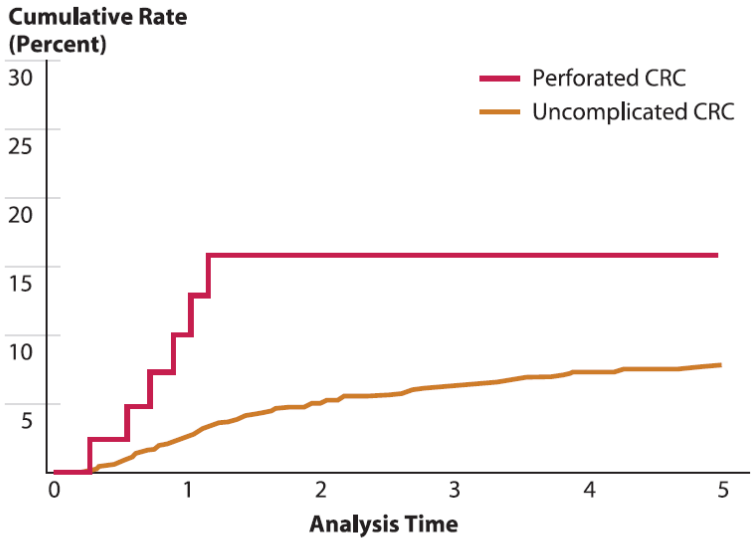


FIGURE 1. Cumulative local recurrence rate.

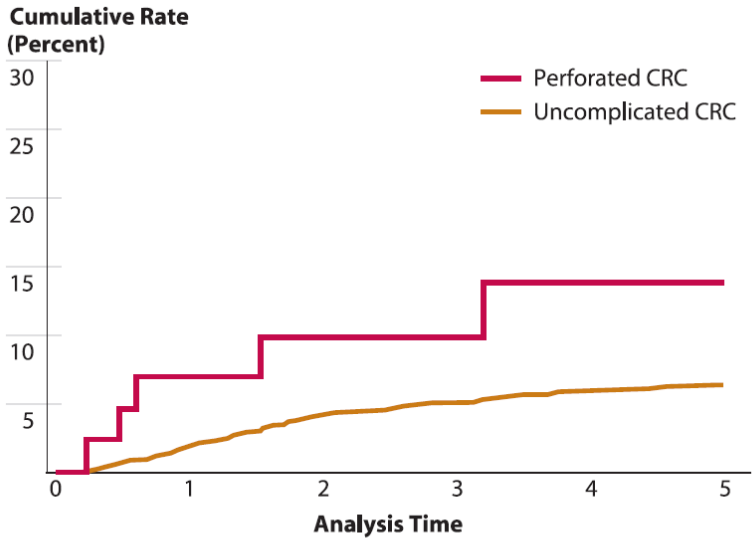


FIGURE 2. Cumulative peritoneal carcinomatosis rate.

Diseases of the Colon & Rectum Volume 52: 3 (2009)

Fact I : Risk factors for PC

- Tumor Perforation
- **Positive Cytology**
- Mucinous Tumors
- T4 Tumors
- Obstruction

POSITIVE CYTOLOGY

Long-Term Prognostic Value of Conventional Peritoneal Lavage Cytology in Patients Undergoing Curative Colorectal Cancer Resection

Shingo Noura, M.D., Ph.D.[1] • Masayuki Ohue, M.D., Ph.D.[1]
Yosuke Seki, M.D., Ph.D.[1] • Masahiko Yano, M.D., Ph.D.[1]
Osamu Ishikawa, M.D., Ph.D.[1] • Masao Kameyama, M.D., Ph.D.[2]

TABLE 6. Univariate analysis of clinicopathological factors for peritoneal recurrence–free survival in patients with pT3 or pT4 tumors

	No. of patients N = 374	*Peritoneal recurrence–free 10-year survival % (95% CI)*	*P value**
Age (years)			
< 60	158	96.0 (92.5–99.5)	0.9760
≥ 60	216	96.5 (94.0–99.0)	
Gender			
Male	222	97.1 (94.7–99.5)	0.5495
Female	152	95.3 (91.6–99.0)	
Tumor size			
< 4 cm	126	97.5 (94.8–100.0)	0.5281
≥ 4 cm	248	95.7 (92.8–98.6)	
Tumor site			
Colon	203	95.5 (92.4–98.6)	0.4500
Rectum	171	97.3 (94.8–99.8)	
Histologic grade			
Well	168	97.5 (95.0–100.0)	0.3350
Others	206	95.1 (91.6–98.6)	
Regional lymph nodes			
pN (-)	208	97.6 (95.2–100.0)	0.0798
pN (+)	166	94.5 (90.8–98.2)	
Lymphatic invasion			
No	115	98.2 (95.8–100.0)	0.2438
Yes	259	95.3 (92.4–98.2)	
Venous invasion			
No	121	98.3 (95.9–100.0)	0.2133
Yes	253	95.2 (92.3–98.1)	
Peritoneal cytology			
Negative	359	97.9 (96.3–99.5)	<0.0001
Positive	15	59.4 (31.2–87.6	

Well = well-differentiated adenocarcinoma; 95% CI = 95% confidence interval.
*Log-rank test

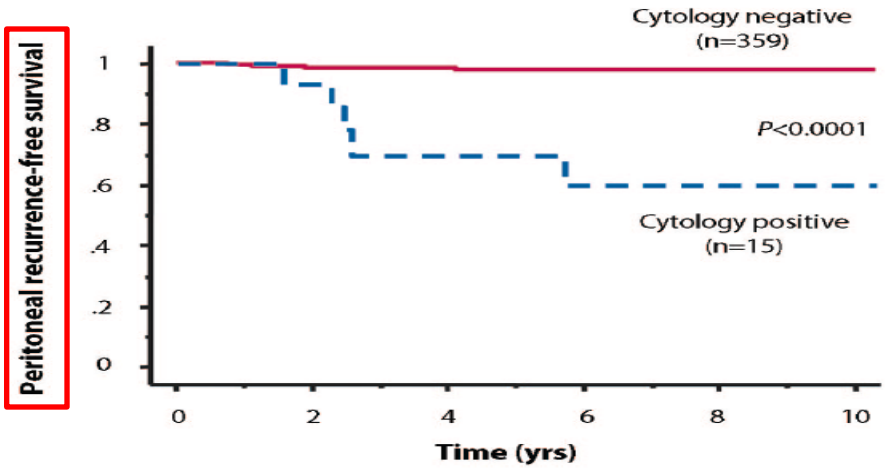


FIGURE 3. Kaplan-Meier curves for peritoneal recurrence–free survival in 374 patients with pT3 or pT4 colorectal tumors: positive *vs.* negative findings for malignant cells with peritoneal lavage cytology.

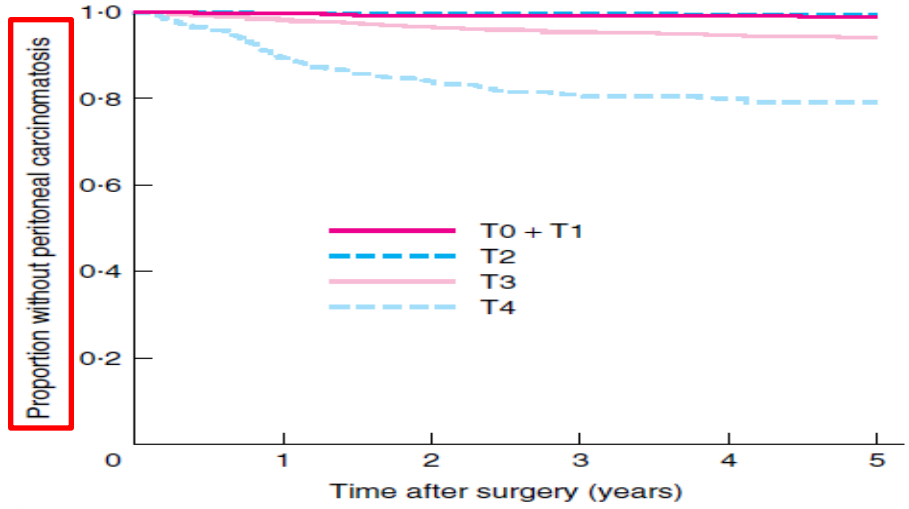
Fact I : Risk factors for PC

- Tumor Perforation
- Positive Cytology
- Mucinous Tumors
- **T4 Tumors**
- Obstruction

T4 TUMORS

Incidence, prevalence and risk factors for peritoneal carcinomatosis from colorectal cancer

J. Segelman[1], F. Granath[2], T. Holm[1], M. Machado[3], H. Mahteme[4] and A. Martling[1]



No. at risk

T0 + T1	422	401	378	349	282	226
T2	1423	1359	1293	1201	1032	854
T3	5285	4743	4232	3726	3029	2483
T4	628	456	362	296	220	163

Fig. 2 Proportion of patients without metachronous peritoneal carcinomatosis after abdominal resection of stage I–III colorectal cancer, according to tumour (T) status ($n = 7758$; patients with missing T status not included). $P < 0{\cdot}001$ (log rank test)

British Journal of Surgery 2012; **99**: 699–705

FACT II

low volume PC = best outcome

Fact II : Low volume PC ⟶ Best outcome

Peritoneal Colorectal Carcinomatosis Treated With Surgery and Perioperative Intraperitoneal Chemotherapy: Retrospective Analysis of 523 Patients From a Multicentric French Study

Dominique Elias, François Gilly, Florent Boutitie, François Quenet, Jean-Marc Bereder, Baudouin Mansvelt, Gérard Lorimier, Pierre Dubè, and Olivier Glehen

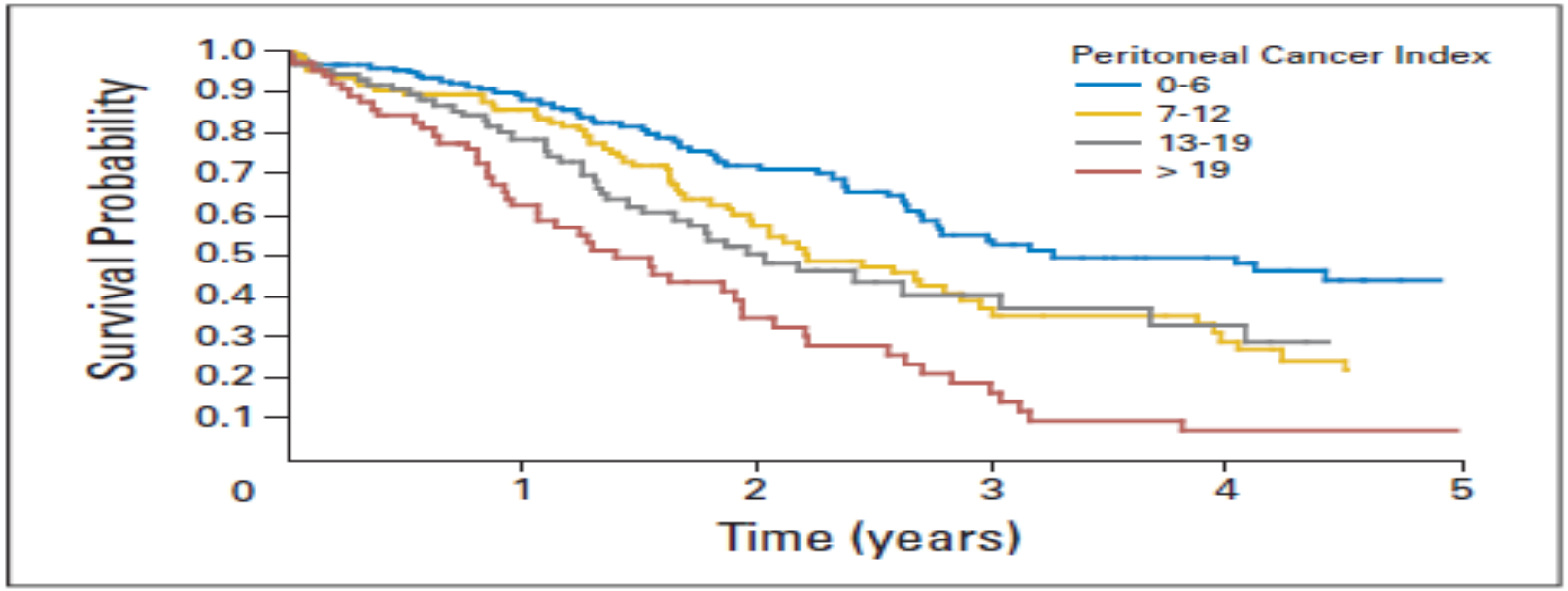


Fig 2. Prognostic impact of the extent of carcinomatosis (ie, peritoneal cancer index; $P < .001$) on overall survival.

J Clin Oncol 28:63-68. © 2009 by American Society of Clinical Oncology

Fact II : Low volume PC ⟶ Best outcome

LOW VOLUME PC = SURROGATE FOR COMPLETNESS OF CYTOREDUCTION

Intraperitoneal chemohyperthermia and attempted cytoreductive surgery in patients with peritoneal carcinomatosis of colorectal origin

O. Glehen[1,3], E. Cotte[1], V. Schreiber[1], A. C. Sayag-Beaujard[2], J. Vignal[1] and F. N. Gilly[1,3]

Table 1 Staging of peritoneal carcinomatosis

Stage 0	No macroscopic disease
Stage 1	Malignant tumour nodules less than 5 mm in diameter, localized in one part of the abdomen
Stage 2	Tumour nodules less than 5 mm in diameter, diffuse to the whole abdomen
Stage 3	Tumour nodules 5–20 mm in diameter
Stage 4	Large (> 20 mm diameter) tumour deposits

Table 3 Assessment of the completeness of cancer resection according to the primary stage of colorectal carcinomatosis

	No. of patients	CCR score 0	CCR score 1	CCR score 2
Stage 1	13	10	3	0
Stage 2	8	4	4	0
Stage 3	7	3	1	3
Stage 4	25	6	3	16

CCR, completeness of cancer resection.

British Journal of Surgery 2004; **91**: 747–754

FACT II

low volume PC = low M&M

Fact II : Low volume PC ⟶ Low M&M

Toxicity and mortality of cytoreduction and intraoperative hyperthermic intraperitoneal chemotherapy in pseudomyxoma peritonei—a report of 103 procedures

R.M. Smeenk*, V.J. Verwaal, F.A.N. Zoetmulder

Table 2
Pre and peroperative factors and their association with toxicity, in 103 PMP patients with PMP treated by cytoreduction and HIPEC

Factor	Number of patients	Percentage toxicity	p value[a,b]
Age			
≤40	12	33	0.05
41–69	71	52	
≥70	20	75	
Previous laparotomy			
No	19	42	ns
Yes	84	57	
Histology PMP[c]			
DPAM	66	52	ns
PMCA (-I)	36	61	
Tumour load[d](regions)			
0–5	35	31	<0.01
6–7	66	65	
Result cytoreduction[e]			
R1	31	32	<0.01
R2	66	64	
Blood loss[f]			
<8 l	43	47	0.01
≥8 l	46	72	
Operation time[g]			
<10 h	50	44	<0.01
≥10 h	41	73	
Suture lines[h]			
≤1	45	33	<0.01
>1	57	70	
Resections[i]			
≤4	53	36	<0.01
>4	49	74	

[a] Uni-variate Chi-square test.
[b] ns, not significant.
[c–i] Data could not be determined in 1, 2, 6, 14, 12, 1, 1 procedures.

R.M. Smeenk et al. / EJSO 32 (2006) 186–190

Potential strategies in ‘ high risk ‘ patients

- Tumor Perforation
- **Positive Cytology**
- Mucinous Tumors
- T4 Tumors
- Obstruction

EARLY SECOND LOOK

Results of Systematic Second-look Surgery Plus HIPEC in Asymptomatic Patients Presenting a High Risk of Developing Colorectal Peritoneal Carcinomatosis

D Elias, MD, PhD, C Honoré, MD,* F Dumont, MD,* M. Ducreux, MD, PhD,† V. Boige, MD, PhD,† D. Malka, MD, PhD,† P. Burtin, MD,† C. Dromain, MD,‡ and D. Goéré, MD**

Peritoneal Carcinomatosis at Second-Look Surgery

Macroscopic PC was discovered in 23 of 41 (56%; group PC+) of these asymptomatic patients during the second-look procedure.

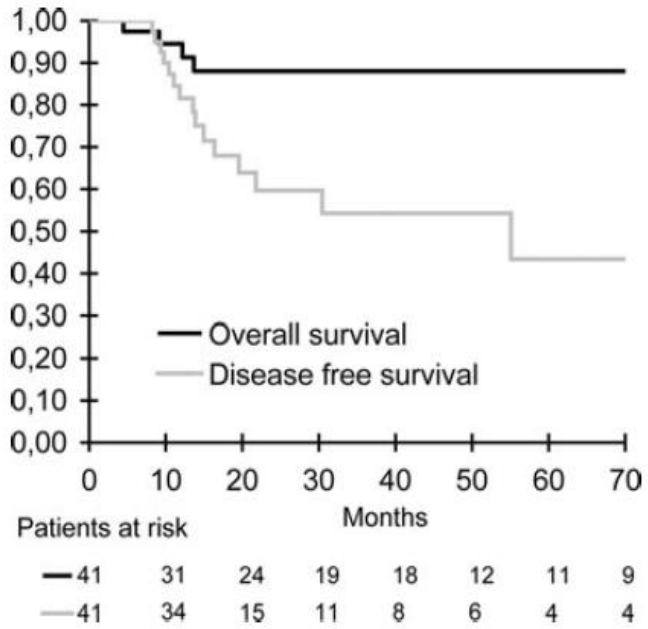


FIGURE 1. Overall and disease-free survival of the 41 patients who underwent systematic second-look surgery plus HIPEC.

ADJUVANT HIPEC

Clinical Study

Prevention of Peritoneal Metastases from Colon Cancer in High-Risk Patients: Preliminary Results of Surgery plus Prophylactic HIPEC

Paolo Sammartino,[1] Simone Sibio,[1] Daniele Biacchi,[1] Maurizio Cardi,[1] Fabio Accarpio,[1] Pietro Mingazzini,[2] Maria Sofia Rosati,[2] Tommaso Cornali,[1] and Angelo Di Giorgio[1]

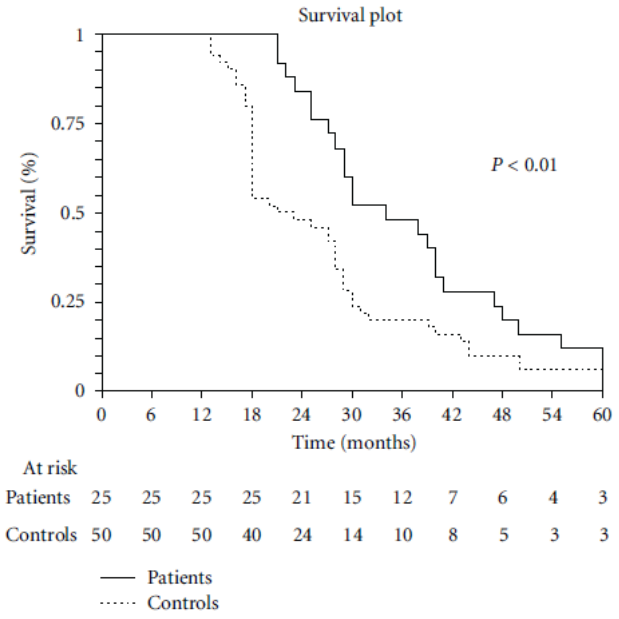


FIGURE 2: Disease free survival.

TABLE 4: Site of recurrence.

	Patients (25)		Controls (50)		P
Metastases	N	%	N	%	
Distant	5	20	9	18	ns
Peritoneal	1	4	11*	22	<0.05
Total	6	24	16	32	ns

* 4 patients had also distant metastases.

CONCLUSIONS

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CONCLUSIONS

- CRS + HIPEC provides very encouraging clinical results in PSM of colorectal and appendiceal origin
- Systemic therapy alone offers no long term survival
- Completeness of cytoreduction
- Acceptable morbidity-mortality
- Aggressively treat all complications
- Reduce the learning curve: side-to side training.
- Move IP chemotherapy up in the timeline of colorectal and appendiceal patients at high risk of PSM

THANK YOU