Parenchyma saving resections-fictions or facts? (Colorectal liver metastasis)

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- Lap. liver resections
  - 643 pat., 713 procedures
  - Re-resections: 101 procedures (31 after open surgery and 70 procedures after laparoscopy)
  - approx. 60% colorectal metastases
  - 35 HCC patients
What is parenchyma/parenchymal sparing/saving resection/technique (PST)

• Definition:
  • A technique sparsely described in the literature
  • A resection that removes the metastasis without compromising cancer-related outcome, sparing as much healthy parenchyma as possible
  • What is gold standard in 2014 – formal or parenchyma sparing? Differs from surgeon, country, culture, disease
“Minimal invasiv surgery, Re-generation Parenchyma sparing technique was described very early”

Zeus eagle eating a part of Prometheus liver every day but during the night it re-generated
(Greek Mythology)
Painter Pieter Paul Rubens

530 BC
PST

• Resection
  – Reduce numbers of segments e.g. seg. 6/7 instead of formal right side hemihepatectomy

• Atypical, local, wedge resection

• What about local ablations:
  – Cryo, RF, Nanoknife, Microwave, HIFU etc.
Why
Parenchyma saving resections?
Short introduction:

Treatment of liver metastasis from colorectal cancer
Resectability

- 10-30% of all patients with liver metastasis from colorectal cancer is potential candidates for curative liver resections\(^1,2\)

\(^1\) McArter MD / Fong Y. Sem Surg Oncol 2000; 19: 177-188
Survival without operation
metastasis from colorectal cancer

Chemotherapy
(overall survival)

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<th>FOLFIRI/FO</th>
<th>FOLFOX/FOL</th>
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<td>Median (month)</td>
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<td>Median followup</td>
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median survival of
10-13 months
# Survival 5 years
## Open / Laparoscopic liver resection

<table>
<thead>
<tr>
<th>First authors, year</th>
<th>Country</th>
<th>No. of patients</th>
<th>3-year overall survival, %</th>
<th>5-year overall survival, %</th>
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<tr>
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<td>Adam et al, 2008</td>
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<td>Zakaria et al, 2007</td>
<td>USA</td>
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<td>Nguyen et al, 2009</td>
<td>Multi-centre study: USA, France</td>
<td>109</td>
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<td>Kazaryan et al, 2010</td>
<td>Norway</td>
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<td>Two-centre study: France</td>
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### Open/Laparoscopic re-resections

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<td>Nordlinger et al, 1994</td>
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<td>26</td>
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### Is Laparoscopic Repeat Hepatectomy Feasible? A Tri-institutional Analysis

Zahra Shafaee¹, Airazat M. Kazaryan², M. Marvin³, K. Ravindra³, Joseph F. Buell³, Bjørn Edwin², Brice Gayet¹.

Treatment have changed to a more aggressive approach

“Maybe it’s time we rethink our passive aggressive approach.”
Multimodal vs. classic approach

"Classical" approach

- Colorectal liver metastases
- Conventional resection, Formal hepatectomy
- Repeated resection?
- Palliative chemotherapy

Multimodal treatment (more aggressive approach)

- Colorectal liver metastases
- Neoadjuvant chemotherapy (downstaging)?
- Portal vein embolisation?
- Two stage hepatectomy?
- Resection and/or ablation
  - Parenchymal sparing surgery
- Adjuvant chemotherapy?
- Lung / adrenal metastases - resection?
- Re-resection/ablation
- Re-evaluation if response
- Chemotherapy
Multimodal treatment in patients with colorectal metastasis.

Change the situation from a disease with a relatively short life expectancy, to a chronic disease with the possibility to live many years extra

(B.Edwin)---personal opinion
Planning both before and during the operation
Parenchyma sparing techniques

Decreased morbidity

Increased possibility for re-resections

Recent studies: **No difference in survival between non-anatomic and anatomic resection.**

No randomised studies
Parenchyma sparing technique

Factors that are important to know more about.

- Influence of resection margins on survival
- What about repeated resections?
- How recurrent metastasis occurs in the liver remnant
- Vascular anatomy --- pre and per operative planning
  - Out and inflow
  - Size of segments
Other important parameters

• Influence of Chemotherapy (neoadj./adj.) on the disease

• Tumor biology
Resection margins influence on survival and recurrence
Resection margin

2 publications 2013 and 2014: 1 mm resection margin is enough for CRLM

**Margin status after laparoscopic resection of colorectal liver metastases: does a narrow resection margin have an influence on survival and local recurrence?**

Nadya Postrigova, Airazat M. Kazaryan, Bård I. Røsok, Åsmund A. Fretland, Leonid Barkhatov & Bjørn Edwin

HPB 2013, ••, •••• © 2013 International

**One-Millimeter Cancer-Free Margin Is Curative for Colorectal Liver Metastases**

A Propensity Score Case-Match Approach

Zaed Z. R. Hamady, PhD, FRCS,† J. Peter A. Lodge, MD, FRCS,‡ Fenella K. Welsh, FRCS,* Giles J. Toogood, DM, FRCS,† Alan White, MRCS,† Timothy John, FRCS,* and Myrddin Rees, FRCS*

*Annals of Surgery* • Volume 259, Number 3, March 2014
Resection margin

• This supports the theory about Parenchyma Sparing Technique (PST), indirectly, in the way that a big amount of liver tissue around the tumor does not need to be resected.
What about Re-resection --- safe?


Repeat curative intent liver surgery is safe and effective for recurrent colorectal liver metastasis: results from an international multi-institutional analysis.


Rates and patterns of recurrence following curative intent surgery for colorectal liver metastasis: an international multi-institutional analysis of 1669 patients.


Repeat curative intent surgery (CIS) for recurrent colorectal liver metastasis can be performed with low morbidity and near-zero mortality. Patients with no extra-hepatic disease are best candidates for repeat CIS. In these patients, repeat CIS can offer the chance of long-term survival.
## Re-resection ---open

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Obs: Perioperative mortality 1.6% (2 patients) in Petrowsky study
Norstein; 30/09/2014
Laparoscopic repeat hepatic resections can be performed safely and with good results, particularly in patients with earlier laparoscopic resections.
Why laparoscopy
Theoretical advantages

Wakabayashi G, Cherqui D, Geller DA, Han HS, Kaneko H, Buell JF.
Six years have passed since the first International Consensus Conference on Laparoscopic Liver Resection was held. This comparatively new surgical technique has evolved since then and is rapidly being adopted worldwide. We compared the theoretical differences between open and laparoscopic liver resection, using right hepatectomy as an example. We also searched the Cochrane Library using the keyword "laparoscopic liver resection." The papers retrieved through the search were reviewed, categorized, and applied to the clinical questions that will be discussed at the 2nd Consensus Conference. The laparoscopic hepatectomy procedure is more difficult to master than the open hepatectomy procedure because of the movement restrictions imposed upon us when we operate from outside the body cavity. However, good visibility of the operative field around the liver, which is located beneath the costal arch, and the magnifying provide for neat transection of the hepatic parenchyma. Another theoretical advantage is that pneumoperitoneum pressure reduces hemorrhage from the hepatic vein. The literature search turned up 67 papers, 23 of which we excluded, leaving only 44. Two randomized controlled trials (RCTs) are underway, but their results are yet to be published. Most of the studies (n = 15) concerned short-term results, with some addressing long-term results (n = 7), cost (n = 6), energy devices (n = 4), and so on. Laparoscopic hepatectomy is theoretically superior to open hepatectomy in terms of good visibility of the operative field due to the magnifying effect and reduced hemorrhage from the hepatic vein due to pneumoperitoneum pressure. However, there is as yet no evidence from previous studies to back this up in terms of short-term and long-term results. The 2nd International Consensus Conference on Laparoscopic Liver Resection will arrive at a consensus on the basis of the best available evidence, with video presentations focusing on surgical techniques and the publication of guidelines for the standardization of procedures based on the experience of experts.
Why laparoscopy?

• Less adhesions, easier to perform repeated resections

• Laurent et al, J Hepatobiliary pancreat surg 2009: *Laparoscopic liver resection facilitates salvage liver transplantation for hepatocellular carcinoma.*

• Personal experience
How metastasis occurs in the liver remnant

Aim: To determine if recurrent liver metastases recur in the same liver lobe as initial metastases, or in the contralateral lobe.

85 patients were found eligible for the study:
- only patients with repeated metastases after primary liver surgery for colorectal metastases were included

Patients divided into three groups:
- Group I – initial metastases in the left lobe (n= 25)
- Group II – initial metastases in the right lobe (n= 40)
- Group III – initial metastases in both lobes (n= 20)
So what ..... 

More then 50% of recurrent liver metastases appear in the contralateral lobe or bi-lobar. This means .......... 

After formal resections compared with parenchyma sparing technique, the patients have less chance of further surgical treatment.
Parenchyma sparing technique
Pre and per operative planning --- 3D map
Vascular Anatomy – In- and outflow, size of segments
*Important knowledge*
Case report: Major resection or Parenchyma-sparing:

- Patient E. – female 48 years old;
- Sigmoidum resection in Jan. 2012, Dukes D cancer
- Synchronous liver metastasis in S7, 17 mm
CT-scan, initial met in S7
Op. 3 month after sigm. res.

Local resection S 7 --- specimen 70*50*20 mm

Tumor 25 mm free resection margin
CT-scan – 3 month after operation
Recurrence 14 month after liver resection, seg 6/7
• Op.14 month after 1st liver resection
• Local resection of segment 6/7
• Tumor – 25 mm
• Specimen 110*80*40 mm, 117 g
• Free resection margin
After 6 month recurrence— S5, S7, S2
• Operated 6 month after 2\textsuperscript{nd} liver resection and 2 years after colon resection
• local resection S7
  specimen 60*55*20 mm, 64 g, tumor 28 mm
• local resection S5
  specimen 35*28*18, 12 g, tumor 14 mm
• left lateral resection, extended to seg 4
  specimen 100*70*25, 127 g, tumor 22 mm
• free margins
CT-scan 1 day after operation
What is next step?
Oslo CoMet study

OSlo Laparoscopic vs. Open resection of COlorectal METastases study.

- Clinicaltrials.gov id: NCT01516710
- Regional ethical approval after dedicated meeting with committee

- “Is randomization really necessary?”
- “Yes, and it’s now or never”
The Comet-story so far

• From Feb 15th 2012 to Oct 1st 2014:
  
  – 186 Patients included
  – Most patients accept
    • Patients demand laparotomy (n=3)
Immunology: There is a difference in the inflammatory response!
There is a difference in Quality of Life!

Role physical

- p=0.035 (at 4 weeks)
- p=0.004 (4 months)

- Open
- Laparoscopic
Why laparoscopy?

• ”Better” for the patient
  – Less pain, faster back to activity, cosmetic
• Easier re-resections/transplant
• Less immune response
• Better QoL
• But we need randomized data!
What to discuss?

• In our opinion, the discussion is now
  – Parenchyma sparing resections
  – How to avoid formal resections
  – How to do them laparoscopically when needed
It is not the strongest, nor the most intelligent who survive, but those most responsive to change.

Charles Darwin (1809-1888)
Thank you very much for your attention!
Formal right hemi hepatectomy?
Vascular anatomy
NO!
Segm.II and III too small
Can we remove the tumor?

Vascular anatomy --- Important !!!
"What about segment 4?"
Norstein; 30/09/2014
YES!

Segm. V and VIII drains to the MHV, segm. VI and VII can be removed with the tumor and the RHV
Post operative result.