



# EWALT | 2023

Eastern and Western Association  
of Liver Tumors (EWALT)

## BOOK OF ABSTRACTS

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# Abstract Information

No.: E23-22 | submitted: June 12, 2023 at 9:38 pm

## Key Facts

**Titel:** Minimally invasive approach to colorectal liver metastases

**Topic:** Minimally invasive/robotic liver surgery

**Format:** ePoster

## Author(s)

**Name(s):** Elroy Patrick Weledji

**Institute(s):** University of Buea, Buea

**Country:** Cameroon

## Introduction

Colorectal cancer liver metastases(CRLM) are present in 15-25% of colorectal cancers and confined to the liver in 70- 80%. However, liver surgery is one of the last frontiers reached by minimally invasive surgery(MIS). Surgical techniques and specialized equipment had evolved to overcome the technical limitations, making laparoscopic resections safe and feasible. The aim of the study was to elucidate the rationale for, and evidence for the safety, efficacy and upward trend of MIS for CRLM.

## Materials & Methods

Electronic searches of the MEDLINE (PubMed) database, Cochran library, and Science citation index were performed to identify original published studies on minimally invasive surgery for colorectal liver metastases.

## Results

~ 10,000 minor and major laparoscopic resections (LLRs) reported in literature since 2000 indicating its wide acceptance and safety. The current indications for LLR do not differ from open liver resections (OLR). Posterior- superior segments and major liver resections were reserved for experienced surgeons in high volume hepatobiliary centers. A meta-analysis showed minor having a better perioperative outcome than OLR with the more difficult repeat hepatectomies. Robotic resections with the 3D view and greater range of movement were useful for complex resections. Parenchyma sparing LLR, tumor ablation techniques, portal vein embolisation and staged procedures positively influenced the expansion of patients for minimally invasive surgical resection. The OSLO-COMET (2018) randomized controlled trial on parenchyma- sparing LLR for CRLM showed significantly fewer postoperative complications, better cost effectiveness and similar free resection margins as OLR. The LapOpHuv (2019) prospective randomized controlled trial on LLRs generally showed a lower global morbidity, similar severe complications, cumulative overall survival and disease -free survival as compared to OLR. Although LLR involved more use of the Pringle 's manoeuvre there was no difference in surgical time, blood loss, transfusion and mortality,

## Summary

Laparoscopic liver resection(LLR) presents similar oncological outcome to OLR. In addition the short and long term advantages of minimally invasive surgery, in the background of multimodal therapy of CRLM is useful. A high degree of experience in MIS is warranted in a hepatobiliary centre.

## Literature

- 1) Fretland AA et al. The OSLO-COMET randomized controlled trial. Ann Surg 2018;267(2): 199-207
  - 2) Robles- Campos R return so. (LaolpHuva). Surg Endoscopy. 2018;34(12):3926-36
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# Abstract Information

No.: E23-26 | submitted: June 13, 2023 at 12:59 pm

## Key Facts

**Titel:** Familial hepatocellular carcinoma: a model for studying preventive and therapeutic measures

**Topic:** Multimodal therapy of HCC

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Elroy Patrick Weledji

**Institute(s):** University of Buea

**Country:** Cameroon

## Introduction

Hepatocellular carcinoma (HCC) is the fifth most common cancer worldwide, with more than 80% of cases found in endemic areas of hepatitis B such as Africa and E. Asia. However, a family history of liver cancer increases HCC risk independently of hepatitis. The hereditary component may act in concert with environmental factors such as hepatitis B. The study reviewed the literature on familial HCC and suggest that familial HCC may be a good model for studying preventive and therapeutic measures.

## Materials & Methods

Electronic searches of the MEDLINE (PubMed) database, Cochran library and Science citation index were performed to identify original published studies on familial HCC, hepatic carcinogens is and the liver epigenome.

## Results

Scattered anecdotal reports have identified familial aggregation of HCC. The combination of family history of liver cancer and hepatitis B/C serum markers is associated with an over 70- fold elevated HCC risk and poor prognosis. A multi factorial inheritance including the novel DICER1 germline mutation and altered liver donation, different single nucleotide polymorphism and the overexpression of the lipoprotein family and serum amyloid A protein in HCC cancer.family members Indicate that genetic factors account for familial aggregation of HCC. By avoiding the confounding influence of constitutive genetic backgrounds, age or cohort effects epigenetic variation analysis in monozygotic twins with HCC would identify the susceptible loci which can be sensitive to modification. Genetic contribution may also explain the presence of healthy or non-healthy carriers of hepatitis BsAg and the aggressiveness in the younger age groups.

## Summary

Limited attention has been given to the role of primary genetic factors in HCC especially as familial clusters are mostly in areas of endemic HBV. Familial HCC may provide knowledge on possible preventive and therapeutic measures . By elucidating the disturbances of the hepatic epigenome the monozygotic twin would be an excellent model.

## Literature

Weledji et al. Familial hepatocellular carcinoma: a model for studying preventive and therapeutic measures. Annals of Medicine and surgery (Lond) 2018)

Weledji et al. How grim is hepatocellular carcinoma. BMC research notes 2016

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# Abstract Information

No.: E23-31 | submitted: June 16, 2023 at 8:16 am

## Key Facts

**Titel:** D-Line approach for laparoscopic cholecystectomy: Initial experience.

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Amr Badawy, Ibrahim Fathy, Tarek Sabra

**Institute(s):** Alexandria Faculty of Medicine, Alexandria Faculty of Medicine, Assuit Faculty of Medicine

**Country:** Egypt, Egypt, Egypt

## Introduction

The critical view of safety is an important concept for safe laparoscopic cholecystectomy. However, no standard step-by-step approach for achieving the critical view of safety has been established until now. Therefore, this study aims to evaluate a new approach for achieving the critical view of safety using the diagonal line of liver segment IV as an anatomical landmark.

## Materials & Methods

In this prospective non-randomized study, patients (n= 112) who underwent laparoscopic cholecystectomy for symptomatic cholelithiasis were included. The first 47 patients underwent laparoscopic cholecystectomy using the diagonal line approach (DLC group) whereas, the next 65 patients underwent laparoscopic cholecystectomy using the conventional method (CLC group).

## Results

No significant difference between both groups regarding the preoperative characteristics, operative time, and intraoperative blood loss. Laparoscopic subtotal cholecystectomy was performed more in the DLC group (6% vs 0%,  $p= 0.07$ ). Whereas, in the CLC group, there was a tendency towards conversion to open cholecystectomy in difficult cases (6% vs 2%,  $p= 0.40$ ). No intra- or postoperative complications occurred in both groups.

## Summary

The diagonal line approach is a feasible and useful step-by-step technique to achieve the critical view of safety in laparoscopic cholecystectomy and enable surgeons to perform safe laparoscopic subtotal cholecystectomy in difficult cases.

## Literature

Tokyo guidelines in 2018 recommended the use of an imaginary line between the base of segment IV and Rouviere's sulcus (RS) as an anatomical landmark to dissect the GB above that line in case of difficult LC. However, RS is not visible in 25% of cases and sometimes the base of segment IV is obscured by severe adhesions. That is why Kitamura et al. proposed the diagonal line (D-line) of liver segment IV as a new anatomical landmark to achieve CVS, especially in the case of difficult LC. Therefore, this study aimed to externally validate this new approach for LC.

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# Abstract Information

No.: E23-61 | submitted: August 25, 2023 at 9:50 am

## Key Facts

**Titel:** N-cadherin: a Diagnostic Marker to help Discriminate Primary Liver Carcinomas from Extrahepatic Carcinomas

**Topic:** Multimodal therapy of liver metastases

**Format:** ePoster

## Author(s)

**Name(s):** Tiemo S. Gerber, Dirk A. Ridder, Benjamin Goeppert, Peter Schirmacher, Peter R. Galle, Hauke Lang, Wilfried Roth, Beate K. Straub

**Institute(s):** Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz, Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz, Institute of Pathology and Neuropathology, RKH Klinikum Ludwigsburg, Ludwigsburg, Institute of Pathology, University of Heidelberg, Heidelberg, 1st Department of Internal Medicine, Gastroenterology and Hepatology, University Medicine, Johannes Gutenberg-University, Mainz, Department of General, Visceral and Transplant Surgery, University Medicine, Johannes Gutenberg-University, Mainz, Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz, Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz

**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Distinguishing primary liver cancer (PLC), namely hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (iCCA), from liver metastases is of crucial clinical importance. Histopathology remains the gold-standard, but differential diagnosis may be challenging. While absent in most epithelial, the expression of the adherens junction glycoprotein N-cadherin is commonly restricted to neural and mesenchymal cells, or carcinoma cells that undergo the phenomenon of epithelial-to-mesenchymal transition (EMT). However, we recently established N- and E-cadherin expression as hallmarks of normal hepatocytes and cholangiocytes, which are also preserved in HCC and iCCA. Therefore, we hypothesized that E- and/or N-cadherin may distinguish between carcinoma derived from the liver versus carcinoma of other origins.

## Materials & Methods

We comprehensively evaluated E- and N-cadherin in 2,489 different tumors in a multicenter study using immunohistochemistry and compared our results with previously published 882 cases of PLC, including 570 HCC and 312 iCCA.

## Results

Most carcinomas showed strong positivity for E-cadherin. Strong N-cadherin positivity was present in HCC and iCCA. However, except for clear cell renal cell carcinoma (23.6% of cases), N-cadherin was rarely and only faintly expressed in adenocarcinomas of the gastrointestinal tract (0-0.5%), lung (7.1%), pancreas (3.9%), gynecological organs (0-7.4%) and breast (2.2%) as well as in urothelial (9.4%) or squamous cell carcinoma (0-5.6%). As expected, N-cadherin was detected in tumors of neuroendocrine origins, such as thyroid cancer (29.2%), neuroendocrine tumors (25-75%), as well as in malignant melanoma (46.2%), and malignant mesothelioma (41%).

## Summary

In conclusion, N-cadherin is a useful marker for the distinction of PLC versus liver metastases of extrahepatic carcinomas ( $p < .01$ ).

## Literature

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# Abstract Information

No.: E23-72 | submitted: August 25, 2023 at 10:00 am

## Key Facts

**Titel:** Reduced Lipid Peroxidation Predicts Unfavorable Prognosis in Hepatocellular Carcinoma, but not Intrahepatic Cholangiocarcinoma

**Topic:** Multimodal therapy of HCC

**Format:** ePoster

## Author(s)

**Name(s):** Tiemo S. Gerber, Hagen R. Witzel, Arndt Weinmann, Fabian Bartsch, Mario Schindeldecker, Peter R. Galle, Hauke Lang, Wilfried Roth, Dirk A. Ridder, Beate K. Straub

**Institute(s):** Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz, Institute of Pathology, University Medicine, Johannes Gutenberg-University, Mainz, Department of Internal Medicine, University Medical Center of the Johannes Gutenberg University, Mainz, Department of General, Visceral and Transplant Surgery, University Medical Center of the Johannes Gutenberg University, Mainz, Institute of Pathology, University Medical Center of the Johannes Gutenberg University, Mainz, Department of Internal Medicine, University Medical Center of the Johannes Gutenberg University, Mainz, Department of General, Visceral and Transplant Surgery, University Medical Center of the Johannes Gutenberg University, Mainz, Institute of Pathology, University Medical Center of the Johannes Gutenberg University, Mainz, Institute of Pathology, University Medical Center of the Johannes Gutenberg University, Mainz, Institute of Pathology, University Medical Center of the Johannes Gutenberg University, Mainz, Institute of Pathology, University Medical Center of the Johannes Gutenberg University, Mainz

**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## **Introduction**

Primary liver cancer, including hepatocellular carcinoma (HCC) and intrahepatic cholangiocarcinoma (iCCA), is a significant contributor to worldwide cancer-related mortality. Oxidative stress and lipid peroxidation play a key role in chronic liver diseases and have been shown to be pivotal for tumor initiation and progression. 4-hydroxy-nonenal (4-HNE), one of the major mediators of oxidative stress and a well-established biomarker for lipid peroxidation, can act as a signal transducer, inducing inflammation, and exerting carcinogenic effects. However, the role of 4-HNE in primary liver cancer remains poorly explored.

## **Materials & Methods**

In this study, we investigated 4-HNE levels in 796 liver carcinomas, including 571 HCC and 236 iCCA, by immunohistochemistry. We then correlated 4-HNE levels with comprehensive clinical data and survival outcomes.

## **Results**

In HCC, lower expression levels of 4-HNE were associated with vascular invasion, high tumor grade, macrotrabecular-massive HCC subtype, and poor overall survival. Concerning iCCA, large duct iCCA showed significantly higher 4-HNE levels when compared to small duct iCCA. Yet, in iCCA, 4-HNE levels did not correlate with known prognostic parameters or survival outcomes.

## **Summary**

To conclude, in HCC, but not in iCCA, low amounts of 4-HNE predict unfavorable survival outcomes and are associated with aggressive tumor behavior. These findings provide insights into the role of 4-HNE in liver cancer progression and may enable novel therapeutic strategies.

## **Literature**

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## **Introduction**

Intrahepatic cholangiocarcinoma (iCCA) may be subdivided into large and small duct types that differ in etiology, molecular alterations, therapy, and prognosis. Therefore, the optimal iCCA subtyping is crucial for the best possible patient outcome.

## **Materials & Methods**

In our study, we analyzed 148 small and 84 large duct iCCA regarding their clinical, radiological, histological, and immunohistochemical features.

## **Results**

Only 8% of small duct iCCA, but 27% of large duct iCCA presented with initial jaundice. Ductal tumor growth pattern and biliary obstruction were significant radiological findings in 33%, and 48% of large duct iCCA, respectively. Biliary epithelial neoplasia and intraductal papillary neoplasms of the bile duct were detected exclusively in large duct type iCCAs. Other distinctive histological features were mucin formation and periductal-infiltrating growth pattern. Immunohistochemical staining against CK20, CA19-9, EMA, CD56, N-cadherin, and CRP could help distinguish between the subtypes.

## **Summary**

To summarize, correct subtyping of iCCA requires an interplay of several factors. While the diagnosis of a precursor lesion, evidence of mucin, or a periductal infiltrating growth pattern indicates the diagnosis of a large duct type, in their absence, several other criteria of diagnosis need to be combined.

## **Literature**

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# Abstract Information

No.: E23-94 | submitted: August 28, 2023 at 11:10 am

## Key Facts

**Titel:** Optimized reconstruction parameters of photon-counting detector computed tomography improve the quality of hepatocellular carcinoma imaging

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** D Graafen, F Stoehr, MC Halfmann, T Emrich, Y Yang, F Foerster, C Düber, R Kloeckner, L Müller

**Institute(s):** Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Department of Medicine I, University Medical Center of the Johannes Gutenberg-University Mainz, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz, Institute of Interventional Radiology, University Hospital Schleswig-Holstein, Campus Lübeck, Diagnostic and Interventional Radiology, University Medical Center of the Johannes Gutenberg-University Mainz

**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Excellent image quality is advantageous for diagnosing HCC non-invasively, due to the tumor's distinct enhancement patterns that eliminate the need for histological proof according to international guidelines. Furthermore, imaging holds a crucial function for treatment decision making and forecasting both prognosis and response to treatment. Photon-counting detector CT (PCD-CT) can enhance abdominal oncologic imaging significantly by higher spatial resolution, reduced image noise and improved contrast-to-noise ratios (CNRs) (1-5). This is further improved by a PCD-CT optimized iterative reconstruction algorithm (quantum iterative reconstruction, QIR) (6,7). The aim of this study was to identify an optimized reconstruction protocol for HCC imaging including the reconstruction kernel and QIR level.

## Materials & Methods

Reconstruction protocol optimization was performed in two steps. In the first step, the effect of different reconstruction kernels was analyzed. Therefore, images of 24 patients with HCC lesions were reconstructed using the regular body and quantitative kernel of the PCD-CT scanner, each with four sharpness levels (36-40-44-48). These images were reconstructed with the QIR level 3. In the second step, images of 44 patients with HCC lesions were reconstructed with a filtered back projection algorithm and all available QIR levels (QIR-1 to QIR-4) using the kernel identified as optimal in the first step. In both steps, quantitative image analysis of CNR and qualitative analysis evaluating noise, lesion conspicuity, and overall image quality using a 5-point Likert scale was performed by three raters. Additionally, sharpness was analyzed in the kernel optimization step and noise levels in the QIR optimization step.

## Results

Kernels with a sharpness level of 36 generated highest CNR in all contrast phases (all  $p < 0.05$ ) while sharpness of the HCC lesion edges were not significantly influenced. Raters evaluated decreased noise and increased overall quality scores in images with softer kernels with (all  $p < 0.05$ ) but without significant differences in lesion conspicuity. Regular body and quantitative kernels with identical sharpness levels yielded no differences in all image quality criteria. The higher the QIR level, the more effectively the image noise was suppressed. E.g., in the QIR-4 images median noise levels were around 50% of the level in the filtered back projection images. As the QIR levels increased, scores given by raters for all image quality criteria improved significantly (all  $p < 0.05$ ).

## Summary

Combination of soft reconstruction kernels with highest QIR level provides best image quality for the evaluation of HCC lesions in PCD-CT. Utilizing quantitative kernels along with the capability for spectral post-processing does not lead to reduced image quality when compared to regular body kernels. The potential enhancement of diagnostic certainty in HCC imaging through optimal image quality in HCC protocol PCD-CT is considerable. Additional advancements could be attainable by applying spectral features like iodine quantification.

## Literature

1. Gutjahr R, Halaweish AF, Yu Z, et al. *Invest Radiol.* 2016;51(7):421–429.
2. Rajagopal JR, Farhadi F, Solomon J, et al. *Acad Radiol.* 2021;28(12):1754–1760.
3. Zhou W, Michalak GJ, Weaver JM, et al. *Invest Radiol.* 2020;55(4):226.
4. Pourmorteza A, Symons R, Sandfort V, et al. *Radiology.* 2016;279(1):239–245.
5. Graafen D, Müller L, Halfmann M, et al. *Eur J Radiol.* 2022;156.
6. Sartoretti, T., Landsmann, A., Nakhostin, D., et al. *Radiology.* 2022;303(2):339-348
7. Racine, D., Mergen, V., Viry, A., et al. (2022). *Invest Radiol.* 2022;58(4):245-252

# Abstract Information

No.: E23-122 | submitted: August 29, 2023 at 5:54 pm

## Key Facts

**Titel:** Impact of Liver Regeneration on Tumor Growth: A Hepatocellular Cancer Patient-Derived Organoid Xenograft Model

**Topic:** Multimodal therapy of HCC

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Fabian Haak, Gabriel Fridolin Hess, Philipp Sedlacek, Caner Ercan, Salvatore Piscuoglio, Mairene Coto-Llerena, Savas Soysal, Otto Kollmar

**Institute(s):** Clarunis, Clarunis, Clarunis, Clarunis, University of Basel, University of Basel, Clarunis, Clarunis

**Country:** Switzerland, Switzerland, Switzerland, Switzerland, Switzerland, Switzerland, Switzerland, Switzerland

## Introduction

Recurrence is a significant problem following treatment for Hepatocellular Carcinoma (HCC). It affects more than 70% of patients receiving a surgical resection. Recurrence can arise from undetected micrometastasis (multicentric tumor) or “de novo” cancer. Clinical and experimental studies suggest that liver regeneration ensuing surgical resection may activate occult micro-metastasis leading to tumor recurrence. Here, we aim to establish an in vivo model to understand the impact of liver regeneration on HCC tumor growth.

## Materials & Methods

Patient Derived Organoids (PDOs) were generated from HCC tissue obtained from patients that underwent liver resection at the University Center for Gastrointestinal and Liver Diseases (Clarunis). HCC-PDO organoids have been proved to retain the histopathological characteristic of the original tumor. After a laparotomy, HCC-PDO were implanted in the liver of NOD Scid gamma mice. Experimental group undergo a re-laparotomy and 30% or 70% hepatectomy while control group only receives a re-laparotomy. Tumor growth was monitored by ultrasound until the end-point of the experiment. Healthy and tumor tissue were characterized using immunohistochemistry.

## Results

The HCC-PDOs implantation process has been refined and optimized regarding scheme of anesthesia, volume and speed of injection. We have successfully performed the implantation of 2 HCC-PDO lines. Tumors obtained from the orthotopic models maintain the histopathological characteristic of the initial tumor. Preliminary results from animals that received resections after implantation, showed an increase in tumor growth compared to control.

## Summary

Preliminary data shows an increased tumor growth rate in our resection groups compared to control groups. Our established orthotopic xenograft model can help understand the molecular basis of HCC recurrence after surgery. Therefore, this model may provide the basis for future projects for specific drug therapy before or after liver resection to inhibit tumor growth and favour regeneration.

## Literature

- Cheng Z, Yang P, Qu S, Zhou J, Yang J, Yang X, Xia Y, Li J, Wang K, Yan Z, Wu D, Zhang B, Hüser N, Shen F. Risk factors and management for early and late intrahepatic recurrence of solitary hepatocellular carcinoma after curative resection. *HPB (Oxford)*. 2015 May;17(5):422-7. doi: 10.1111/hpb.12367. Epub 2014 Nov 24. PMID: 25421805; PMCID: PMC4402053.
  - Shi JH, Huitfeldt HS, Suo ZH, Line PD. Growth of hepatocellular carcinoma in the regenerating liver. *Liver Transpl*. 2011 Jul;17(7):866-74. doi: 10.1002/lt.22325. Erratum in: *Liver Transpl*. 2020 Mar;26(3):469. PMID: 21542129.
  - de Jong KP, Slooff MJ, de Vries EG, Brouwers MA, Terpstra OT. Effect of partial liver resection on tumour growth. *J Hepatol*. 1996 Jul;25(1):109-21. doi: 10.1016/s0168-8278(96)80336-9. PMID: 8836910.
  - Heinrich S, Jochum W, Graf R, Clavien PA. Portal vein ligation and partial hepatectomy differentially influence growth of intrahepatic metastasis and liver regeneration in mice. *J Hepatol*. 2006 Jul;45(1):35-42. doi: 10.1016/j.jhep.2006.02.020. Epub 2006 Apr 14. PMID: 16698111.
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# Abstract Information

No.: E23-139 | submitted: August 30, 2023 at 1:30 pm

## Key Facts

**Titel:** Predictive factors of 90-day mortality after hepatic resection for hepatocellular carcinoma: a single-center experience.

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** S. Vaghiri, S. Kalmuk, O. Mustafov, A. Krieg, A. Rehders, A. Alexander, N. Lehwald-Tywuschik, W.T. Knoefel, L. Dizdar

**Institute(s):** Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf, Department of Surgery (A), Heinrich-Heine-University and University Hospital Duesseldorf

**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Hepatic resection (HR) remains the mainstay of curative treatment intention in primary liver malignancies including hepatocellular carcinoma (HCC). Despite major advances in perioperative care and evolving surgical techniques, postoperative mortality remains a major concerning issue especially following major hepatectomy. The primary aim was therefore to elucidate predictive risk factors associated with 90-day mortality after HR in HCC.

## Materials & Methods

All patients undergoing elective resection for HCC from a single- institutional and prospectively maintained database were included. Multivariate cox regression analysis was conducted to identify patient-specific, intra-, and postoperative predictive factors of 90-day mortality after elective HR.

## Results

Between August 2004 and October 2021, 196 patients were enrolled (148 male /48 female). The median age of the study cohort was 68.5 years (range 19-84 years). Major hepatectomy (? 3 segments) was performed in 84 patients necessitating prior portal venous embolization (PVE) in 8 cases respectively in situ split plus portal vein ligation (ISLT) in 7 patients. Multivariate analysis revealed patient age  $\geq$  70 years [ $p=0.029$ , 95% CI (1.123-8.692)], preoperative renal impairment [ $p=0.006$ , 95% CI (1.434-9.107)], postoperative liver failure ISGLS grade B/C [ $p=>0.0001$ , 95% CI (3.403-41.029)], positive lymph node involvement, [ $p=0.003$ , 95% (1,989-31.466)], and hepatic augmentation techniques (PVE/ISLT) [ $p=0.008$ , 95% CI (1.434-10.754)] as the major significant determinants of the 90-day mortality.

## Summary

Careful patient selection is pivotal in the elderly population considered for extended hepatectomy for HCC using either PVE or ISLT. Targeting predictive survival factors by optimizing modifiable pre- and postoperative conditions in a multidisciplinary approach could potentially reduce the 90-day mortality rates following HR.

## Literature

1. McCormack L, Petrowsky H, Clavien P-A (2005) Surgical therapy of hepatocellular carcinoma. *Eur J Gastroenterol Hepatol* 17:497–503. <https://doi.org/10.1097/00042737-200505000-00005>
  2. Lei GY, Shen L, Junnarkar SP, et al (2021) Predictors of 90-Day Mortality following Hepatic Resection for Hepatocellular Carcinoma. *Visc Med* 37:102–109. <https://doi.org/10.1159/000510811>
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## Introduction

Preoperative volumetry of the future liver remnant (FLR) is essential to minimize the risk of posthepatectomy liver failure. For volumetry, manual tracing on computed tomography (CT) images is still widely used but may be time-consuming and operator dependent. To overcome these disadvantages, several three-dimensional simulation software programs have been developed; however, their efficacy has not fully been compared to that of manual tracing volumetry.

## Materials & Methods

Retrospective data were collected on 30 patients who underwent formal right hepatectomy at The University of Texas MD Anderson Cancer Center from January 1, 2010, through December 31, 2015. Three physicians performed liver volumetry on preoperative CT images using manual tracing volumetry and two simulation software programs, SYNAPSE and syngo.via. The standardized FLR (sFLR), defined as the ratio of the calculated left-liver volume to the standardized total liver volume, was calculated using each method of volumetry. The primary endpoint was reproducibility evaluated using Bland-Altman analysis. Secondary outcomes were calculation time and learning curve.

## Results

The mean sFLR was significantly lower for manual volumetry (30.1%) than for SYNAPSE (32.0%,  $p = 0.002$ ) or syngo.via (32.0%,  $p = 0.100$ ). Mean calculation time was shorter for SYNAPSE (6.4 minutes) compared with manual volumetry (42.9 minutes,  $p < 0.001$ ) and with syngo.via (10.8 minutes,  $p < 0.001$ ). For the two physicians unfamiliar with the software, no obvious learning curve was observed for using SYNAPSE, whereas learning curves were observed for using syngo.via with a peak at approximately the 8th and 14th patients.

## Summary

Liver volumetry was more reproducible and faster with three-dimensional simulation software, especially SYNAPSE software, than with the conventional manual tracing method. Software can help even inexperienced physicians learn quickly how to perform liver volumetry.

## Literature

Kishi Y, Abdalla EK, Chun YS, et al. Three hundred and one consecutive extended right hepatectomies: evaluation of outcome based on systematic liver volumetry. *Ann Surg.* Oct 2009;250(4):540-8. doi:10.1097/SLA.0b013e3181b674df

Vauthey JN, Chaoui A, Do KA, et al. Standardized measurement of the future liver remnant prior to extended liver resection: methodology and clinical associations. *Surgery.* May 2000;127(5):512-9. doi:10.1067/msy.2000.105294

Suzuki K, Epstein ML, Kohlbrenner R, et al. Quantitative radiology: automated CT liver volumetry compared with interactive volumetry and manual volumetry. *AJR Am J Roentgenol.* Oct 2011;197(4):W706-12. doi:10.2214/AJR.10.5958

Mise Y, Hasegawa K, Satou S, et al. How Has Virtual Hepatectomy Changed the Practice of Liver Surgery?: Experience of 1194 Virtual Hepatectomy Before Liver Resection and Living Donor Liver Transplantation. *Ann Surg.* Jul 2018;268(1):127-133. doi:10.1097/SLA.0000000000002213

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# Abstract Information

No.: E23-160 | submitted: August 31, 2023 at 8:44 am

## Key Facts

**Titel:** Preoperative Recurrence Score: development and internal validation of a simple tool to predict early recurrence after surgery in cholangiocarcinoma

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** S. Conci, G. Catalano, D. D'Amore, M. De Bellis, T. Campagnaro, R. De Robertis, L. Alaimo, M. D'Onofrio, A. Ruzzenente, A. Guglielmi

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**Country:** Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy

## Introduction

Despite advances in surgical techniques, the rate of early recurrence in perihilar cholangiocarcinoma (PCC) remains high. In this study, we sought to identify preoperative radiological predictive factors for recurrence in order to develop a simple prognostic tool to avoid futile up-front surgery in peri-hilar cholangiocarcinoma: the Preoperative Recurrence Score (PRS).

## Materials & Methods

Data of patients who underwent surgery for PCC between 2009 and 2020 were retrospectively collected. Only patients with CT or MRI performed before any invasive procedure were included. The images were analyzed and reviewed to evaluate tumor size, presence of suspected lymphadenopathy, vascular involvement both portal and arterial, and biliary extension according with Bismuth classification. Univariate and multivariate analyses on RFS were performed to identify the risk factors and determine the HR of each one. The PRS was based on the respective HR, and then validated using a prospective internal cohort of patients who underwent surgery for PCC in 2021 and 2022.

## Results

The testing cohort and the validation cohort included 54 and 27 patients, respectively. Preoperative radiological factor related with RFS were portal invasion (HR 2.473,  $p=0.019$ ), suspected lymph-nodes (HR 2.048,  $p=0.042$ ), tumor size  $>18\text{mm}$  (HR 1.879,  $p=0.047$ ), and arterial invasion (HR 1.512,  $p=0.032$ ). The PRS was calculated based on HR of each factor and the cohort were divided into low ( $< 5$  points) and high risk ( $\geq 5$  points) group. Recurrence rates were 0.0% and 27% at 6 months and 24% and 62% at 12 months in low and high risk group respectively ( $p=0.006$ ,  $p=0.007$ ). Applying the PRS score to the validation cohort: recurrence rates at 12 months were 14% in low risk and 67% in high risk group ( $p=0.036$ ).

## Summary

The Preoperative Recurrence Score is a simple tool useful to preoperatively stratify the risk of recurrence in resectable PCC patients. A high PRS was significantly associated with lower PFS in PCC patients in a retrospective training cohort and in a prospective internal validation cohort. Up-front surgery should be carefully evaluated in patients with high PRS. Multimodal and integrated treatment strategies should be considered in high risk patients.

## Literature

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  2. Khan, S. A. et al. Guidelines for the diagnosis and treatment of cholangiocarcinoma: an update. *Gut* 61, 1657–1669 (2012).
  3. Zhou, Y., Liu, S., Wu, L. & Wan, T. Survival after surgical resection of distal cholangiocarcinoma: A systematic review and meta-analysis of prognostic factors. *Asian J Surg* 40, 129–138 (2017).
  4. Ku, D. et al. Survival outcomes of hepatic resections in Bismuth-Corlette type IV cholangiocarcinoma. *ANZ J Surg* 90, 1604–1614 (2020).
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  7. Choi, W. J. et al. Systematic Review and Meta-Analysis of Prognostic Factors for Early Recurrence in Intrahepatic Cholangiocarcinoma After Curative-Intent Resection. *Ann Surg Oncol* 29, 4337–4353 (2022).
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# Abstract Information

No.: E23-167 | submitted: August 31, 2023 at 9:43 am

## Key Facts

**Titel:** Results of liver resection and liver transplantation for treatment of hepatoblastoma

**Topic:** Liver transplantation

**Format:** ePoster

## Author(s)

**Name(s):** Oleh Kotenko, Marat Grygorian, Artem Minich, Oksana Mykhailiuk, Ivan Kotenko, Andrii Matviienkiv

**Institute(s):** Medical Center "Universal Clinic "Oberig", Medical Center "Universal Clinic "Oberig", Medical Center "Universal Clinic "Oberig", Medical Center "Universal Clinic "Oberig", Medical Center "Universal Clinic "Oberig", Medical Center "Universal Clinic "Oberig"

**Country:** Ukraine, Ukraine, Ukraine, Ukraine, Ukraine, Ukraine

## Introduction

Radical resection of hepatoblastoma can be obtained either conventionally by partial hepatectomy or by total hepatectomy with orthotopic liver transplantation thereafter. Liver transplantation has been increasingly performed for unresectable hepatoblastoma with acceptable results. Overall, outcomes have greatly improved because of advances in chemotherapy and innovations of surgical technologies, including the liver transplantation.

## Materials & Methods

The aim of this study was to study results of surgical treatment patients with hepatoblastoma in period 2005 to 2022 years and compare outcome between liver resection group and liver transplantation group. 90 children with hepatoblastoma have entered the study. The age range at surgery was 4 months to 5.6 years (median 28 months). Five patients (5.6%) were PRETEXT group I, 30 (33.3%) group II, 45 (50%) group III and 10 (11.1%) group IV. Patients with PRETEXT IV tumors, multifocal tumors and tumors invading major vessels of the liver underwent liver transplantation.

## Results

The overall 1-,3- and 5-year survival rate for 80 patients after liver resection and for 10 patients after liver transplantation in the study was 91.2%, 88.8%, 71.2% and 100%, 90%, 80%, respectively. Recurrence-free 1-,3- and 5-year survival rate for liver resection group and for liver transplantation group in the study was 87.5%, 80%, 72.5% and 100%, 90%, 80%, respectively. Operative morbidity and mortality after liver resection and after liver transplantation were 12,5% and 8.75%, 10% and 0%, respectively. Seven patients died after extended hepatectomies. After a median follow-up of 3.8 years (range 1.5-5.3 years), 67 (74.4%) of the patients were tumor-free in remission.

## Summary

Resection and transplantation technology in combination with chemotherapy allows to obtain a good long-term outcome. We did not find any difference in the long-term results between resection and transplantation groups although in transplantation group patients liver tumor lesion was more extensive.

## Literature

1. Lim I.I.P., Bondoc A.J., Geller J.I., Tiao G.M. Hepatoblastoma—The Evolution of Biology, Surgery, and Transplantation. *Children*. 2018;6:1.
  2. Angelico R., Grimaldi C., Gazia C., Saffioti M.C., Manzia T.M., Castellano A., Marco Spada M. How Do Synchronous Lung Metastases Influence the Surgical Management of Children with Hepatoblastoma? An Update and Systematic Review of the Literature. *Cancers*. 2019;11:1693.
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# Abstract Information

No.: E23-172 | submitted: August 31, 2023 at 11:50 am

## Key Facts

**Titel:** Extended Resection in advanced Gallbladder cancer—still a reasonable procedure?

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Constantin Scholz, Arndt Weinmann, Hauke Lang, Fabian Bartsch

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**Country:** Germany, Germany, Germany, Germany

## Introduction

Gallbladder Cancer (GBCa) is a rare disease associated with a poor prognosis, which mostly depends on the time of diagnosis and surgical resection. Especially in advanced disease it remains unclear if patients truly benefit of extended liver resection.

Objective of our retrospective analysis was the comparison of patients undergoing surgery for gallbladder cancer with those who received palliative chemotherapy only due to unresectability.

## Materials & Methods

All patients with GBCa, who underwent surgery at the University Medical Center Mainz between 2008-2022 or received palliative Chemotherapy were collected in a prospective institutional Database. Resections of up to two segments were defined as minor Hepatectomy (MiH), whereas every resection above two Segments was denoted as major hepatectomy (MaH). Patients with unresectable disease were either undergoing a surgical exploration (explorative Laparotomy, EL) or received palliative Chemotherapy (PC) directly, if tumor was radiographically unresectable. Survival data was analyzed using the

## Results

In total, n=159 Patients with GBCa were included. Females were affected more frequently than males (97 vs. 62). Median age during surgery was 67,24 years (32-86). 19 Patients were found to be unresectable radiographically and received a palliative Chemotherapy, whereas 51 received palliative chemotherapy after determining unresectability intraoperatively during explorative laparotomy (EL). Out of 74 Patients undergoing resection, the majority was treated by a minor hepatectomy (54 vs. 20). Median survival in the minor group was 25,82 months and significantly differed from the MaH (11,7 months) group as well as EL (10,68 months) and PC (8,77 months). No significant improved survival of MaH compared to EL ( $p=0,051$ ) and PC ( $p=0,241$ ) was observed.

## Summary

We performed a single center retrospective study to compare survival after liver resection with palliative Chemotherapy. Patients with a tumor spread being amenable to Minor Hepatectomy benefit from a surgical treatment, while extended resection in an advanced tumor might not necessarily lead to survival improvement. Considering the high morbidity and mortality that goes with an extended resection, a palliative chemotherapy should be at least offered to patients before undergoing Major Hepatectomy.

## Literature

Balakrishnan A, Barmponakis P, Demir N, Jah A, Spiers HVM, Talukder S, u. a. Surgical outcomes of gallbladder cancer: the OMEGA retrospective, multicentre, international cohort study. *eClinicalMedicine*. Mai 2023;59:101951.

Goetze TO. Gallbladder carcinoma: Prognostic factors and therapeutic options. *World J Gastroenterol*. 21. November 2015;21(43):12211–7.

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# Abstract Information

No.: E23-183 | submitted: August 31, 2023 at 12:08 pm

## Key Facts

**Title:** Percutaneous ablation of small-HCC in proximity with major vascular structures (Perivascular HCC): Impact on Local Tumor Progression

**Topic:** Locoregional treatment of liver lesions

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** S. Conci, A. Bianco, A. Marchese, M. D'Onofrio, T. Campagnaro, M. De Bellis, L. Alaimo, G. Mansueto, A. Guglielmi, A. Ruzzenente

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**Country:** Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy, Italy

## Introduction

Percutaneous radiofrequency ablation (RFA) is a standard treatment for small Hepatocellular carcinoma (HCC) (<3cm). However, some features as proximity to intrahepatic vascular structures (perivascular location) seem to be related to local tumor progression (LTP). The aims of the study were identify the features related to LTP, and to investigate the impact of perivascular location.

## Materials & Methods

From January 2010 through May 2021, 611 HCC nodules ablated with US-guided single probe percutaneous RFA were prospectively collected and retrospectively analyzed. Clinical and radiological features related to LTP were identified by Cox-logistic regression analysis. The Kaplan-Meier method was used to estimate the LTP free survival probabilities.

## Results

Overall ablation success rate was 79.7% (n 487). Morbidity and mortality rates were 4.7% and 0.0%, 19.5% (n 95) of the nodules had a perivascular location. The following features resulted independently related to higher LTP free survival: nodule size <20mm (HR 2.402, IC 95% 1.680-3.435, p 5mm (HR 2.609, IC 95% 1.794-3.794, p<0.001). Regarding perivascular nodules, nodules size <20mm (HR 2.638, IC 95% 1.327-5.246, p=0.006), proximity to Glissonian pedicles (HR 1.892, IC 95% 1.039-3.814, p=0.024) and major vascular structure diameter <5mm (HR 2.149, IC 95% 1.015-4.551, p=0.046) resulted independently related to higher LTP free survival.

## Summary

Perivascular location confirmed to be a difficult and unfavorable indication for percutaneous ablation for HCC nodules. However, perivascular nodules not suitable for surgery with low-risk features (size <20mm, proximity to Glissonian pedicles and vascular diameter <5mm) may be treated with RFA with satisfactory outcomes.

## Literature

1. Conci S, D'Onofrio M, Bianco A, Campagnaro T, Martone E, De Bellis M, et al. Ablation Difficulty Score: Proposal of a new tool to predict success rate of percutaneous ablation for hepatocarcinoma. *Eur J Radiol.* (2022). 146:110097.
  2. Chen J, Peng K, Hu D, Shen J, Zhou Z, Xu L, et al. Tumor location influences oncologic outcomes of hepatocellular carcinoma patients undergoing radiofrequency ablation. *Cancers* (2018). 10,378.
  3. Lai Z-C, Liang J-Y, Chen L-D, Wang Z, Ruan S-M, Xie X-Y, et al. Do hepatocellular carcinomas located in subcapsular space or in proximity to vessels increase the rate of local tumor progression? A meta-analysis. *Life Sciences* (2018). 207:381-385.
  4. Loriaud A, Denys A, Seror O, Violi NV, Digkila A, Duran R, et al. Hepatocellular carcinoma abutting large vessels: comparison of four percutaneous ablation systems, *Int J Hyperthermia* (2018). 34:8, 1171-1178.
  5. Cao S, Lyu T, Fan Z, Guan H, Song L, Tong X, et al. Long-term outcome of percutaneous radiofrequency ablation for periportal hepatocellular carcinoma: tumor recurrence or progression, survival and clinical significance. *Cancer Imaging.* (2022). 22(1):2.
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# Abstract Information

No.: E23-192 | submitted: August 31, 2023 at 5:18 pm

## Key Facts

**Titel:** Robotic or laparoscopic repeat hepatectomy after open hepatectomy

**Topic:** Minimally invasive/robotic liver surgery

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Emrullah Birgin, Schaima Abdelhadi, Steffen Seyfried, Erik Rasbach, Mohammad Rahbari, Patrick Téoule, Christoph Reißfelder, Nuh N. Rahbari

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**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Repeat hepatectomies are considered technically complex procedures for recurrent lesions. The feasibility of minimally invasive repeat hepatectomies (MIRH) has been proven previously and revealed that laparoscopic repeat hepatectomy is associated with fewer postoperative complications, shorter hospitalization and lower blood loss compared to open repeat hepatectomies for recurrent hepatocellular carcinomas. However, these studies included mixed cohorts of patients with previous open and predominantly minimally invasive liver resections. In the present study, we compared outcomes of patients with MIRH versus open repeat hepatectomies in patients with liver tumors after previous open hepatectomy. 1-3

## Materials & Methods

We identified patients who underwent repeat hepatectomies after previous open hepatectomy from a prospectively collected database. We excluded patients who underwent extrahepatic, vascular, and multivisceral resections. Patients were stratified by in a MIRH and an open repeat hepatectomy (ORH) group by intention to treat and postoperative outcomes were compared between the study groups. The utilization of minimally invasive approach was evaluated by regression analysis.

## Results

A total of 131 repeat hepatectomies were performed during the study period from April 2017 and May 2023. Of these, 46 patients met our inclusion criteria including 20 patients who underwent MIRH and 26 patients who underwent ORH. The majority of patients had advanced or expert repeat hepatectomies (n=27, 59%) according to the IWATE scoring system. There were no preoperative or intraoperative factors to be associated with a preferential use of a minimally invasive approach for repeat hepatectomy. Patients who underwent MIRH had a significant less median blood loss as compared to ORH (450 ml vs. 600ml,  $P = 0.032$ ) and a shorter median length of stay (5 days versus 7 days,  $P = 0.041$ ). There were no significant differences with regard to postoperative complications between the groups ( $P = 0.298$ ).

## Summary

MIRH is a safe alternative to ORH after previous open hepatectomy.

## Literature

1 Xiang Z-Q, Zhu F-F, Zhao S-Q, Li H-J, Long Z-T, Wang Q, Dai X-M, Zhu Z (2023) Laparoscopic versus open repeat hepatectomy for recurrent hepatocellular carcinoma: a systematic review and meta-analysis of propensity score-matched cohort studies. *International Journal of Surgery* 109

2 Kanazawa A, Tsukamoto T, Shimizu S, Kodai S, Yamamoto S, Yamazoe S, Ohira G, Nakajima T (2013) Laparoscopic liver resection for treating recurrent hepatocellular carcinoma. *J Hepatobiliary Pancreat Sci* 20:512-517

3 Birgin E, Hartwig V, Rasbach E, Seyfried S, Rahbari M, Reeg A, Jentschura SL, Téoule P, Reißfelder C, Rahbari NN. Minimally invasive mesohepatectomy for centrally located liver lesions-a case series. *Surg Endosc*. 2022 Dec;36(12):8935-8942. doi: 10.1007/s00464-022-09342-3. Epub 2022 Jun 6. PMID: 35668311; PMCID: PMC9652264.

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# Abstract Information

No.: E23-207 | submitted: August 31, 2023 at 6:36 pm

## Key Facts

**Titel:** Factors associated with prolonged disease- free and overall survival following curative hepatic resection for hepatocellular carcinoma: an observation

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** S. Vaghiri, S. Kalmuk, O. Mustafov, A. Krieg, A. Rehders, A. Alexander, N. Lehwald-Tywuschik, W. T. Knoefel, L. Dizdar

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**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Hepatocellular carcinoma (HCC) is the most common primary liver tumor and a leading cause of cancer-related deaths worldwide. Surgical resection is the cornerstone of a broad range of multimodal treatment concepts in HCC. However, high tumor recurrence and low survival rates after surgical resection still constitutes a major problem after curative intent resection. Our primary goal was to assess clinico-pathological factors associated with disease-free (DFS) and overall survival (OS) in patients with HCC undergoing hepatic resection.

## Materials & Methods

Between August 2004 and October 2021, 196 patients underwent elective hepatic resection for hepatocellular carcinoma at our institution. Patient data were collected from a prospectively maintained database. DFS and OS rates in relation to clinical characteristics, laboratory parameters, histopathological, operative, and postoperative outcome variables were calculated using Log rank and multivariate Cox regression analyses with bootstrapping.

## Results

The postoperative 1-, 3- and 5- year overall DFS and OS rates were 77.9%, 49.7%, and 41% respectively 73.9%, 54.7%, and 38.8%. M-Stage ( $p= 0.30$ ), presence of lymphangio-invasion (L1) ( $p= 0.036$ ), intraoperative biliary reconstruction ( $p= 0.005$ ), and postoperative liver failure ISGLS grade B/C were significantly associated with OS while chronic alcohol abuse ( $p= 0.30$ ), tumor diameter  $\geq 4.5$  cm ( $p= 0.028$ ), and postoperative intra-abdominal abscess formation ( $p > 0.0001$ ) were significant determinants of DFS.

## Summary

Advanced tumor stage with distant metastasis and lymphangio-invasion as well as biliary reconstruction and postoperative liver failure ISGLS grade B/C significantly predict OS after curative intent resection in HCC. Concomitantly tumor recurrence is influenced by chronic preoperative alcohol abuse, tumor diameter and postoperative abscess formation. Potential therapeutic approaches focusing on these variables may help to achieve higher OS and DFS rates.

## Literature

1. Lai Y, Lee J-C, Hung H-C, et al (2020) Models to predict disease-free survival for hepatocellular carcinoma patients with surgical resections. *J Surg Oncol* 122:1444–1452. <https://doi.org/10.1002/jso.26169>
  2. Lang H, Sotiropoulos GC, Brokalaki EI, et al (2007) Survival and recurrence rates after resection for hepatocellular carcinoma in noncirrhotic livers. *J Am Coll Surg* 205:27–36. <https://doi.org/10.1016/j.jamcollsurg.2007.03.002>
  3. Yeh C-N, Lee W-C, Chen M-F, Tsay P-K (2003) Predictors of long-term disease-free survival after resection of hepatocellular carcinoma: two decades of experience at Chang Gung Memorial Hospital. *Ann Surg Oncol* 10:916–921. <https://doi.org/10.1245/aso.2003.09.012>
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# Abstract Information

No.: E23-224 | submitted: August 31, 2023 at 9:59 pm

## Key Facts

**Titel:** Hepatic resection of non colorectal non neuroendocrine liver metastases

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Vladimír Fryba, Jan Ulrych, Zdeněk Krska, David Hoskovec

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**Country:** Czech Republic, Czech Republic, Czech Republic, Czech Republic

## Introduction

Liver resection of colorectal and neuroendocrine metastases has become the standard treatment method which brings a clear oncological benefit for patients (disease free survival, overall survival). The role of surgery in managing non colorectal non neuroendocrine liver metastases is not yet clearly defined. The indications for liver resection are usually based on similar criteria as for colorectal liver metastases, however, the results are not comparable due to the different type of tumour spread and the large heterogeneity of the group.

## Materials & Methods

We performed a retrospective analyses of patients who underwent liver resection of non colorectal non neuroendocrine metastases at the 1st Department of Surgery of General University Hospital in Prague between January 2013 and July 2022. We evaluated demographic characteristics of the patients, histological subtypes of the primary tumor and basic oncological data.

## Results

A total of 69 patients were included in the study. Female patients represented 65,2 % (45 patients). The patients' mean age was 59,1 years, range of 37-83 years. Solitary metastasis was resected in 41 patients (59,4 %), the remaining 28 patients (41,6 %) had multiple metastases. 9 patients underwent repeat resection. The most common indications for liver resection were metastases from malignant melanoma (13 patients – 18,8 %), from breast cancer and gynaecological tumours (both 11 patients – 15,9 %). When subgroups of patients with metastases of melanoma and breast cancer were analysed, for breast cancer, females were dominant (10 patients – 91 %), for melanoma, gender representation was comparable (6 female – 46 %/ 7 male – 54 %). Patients with melanoma were more likely to have multiple involvement (10 patients – 77 %) compared to 4 patients with breast cancer metastases (36 %). Regarding the oncologic outcomes, surgical treatment was accompanied by a high rate of relapse in the liver in both subgroups (breast cancer in 11 patients (72 %) and melanoma in 12 patients (92 %), however, melanoma recurrence occurred earlier and with a worse impact on survival.

## Summary

The oncological benefit of liver resection in non colorectal non neuroendocrine metastases should be evaluated in the context of specific malignancies. We have shown that the patient population is so heterogeneous that all analyses should be related to the specific malignancy. Therefore, the indication for liver resection should be directed by the multidisciplinary team after assessing the benefit to the individual patient.

## Literature

Surgery for Liver Metastasis of Non-Colorectal and Non-Neuroendocrine Tumors.

Katou S, Schmid F, Silveira C et al.

J Clin Med. 2022 Mar 29;11(7):1906. doi: 10.3390/jcm11071906.

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# Abstract Information

No.: E23-230 | submitted: September 1, 2023 at 1:22 pm

## Key Facts

**Titel:** Parenchyma saving resection of a central giant focal nodular hyperplasia in a young adult via a multimodal approach

**Topic:** Liver resection (technic)

**Format:** ePoster

## Author(s)

**Name(s):** Ernst Wolfgang Kolbe, Michael Kaspari, Omar Al Natour, Günther Winde, Alexander Petrovitch

**Institute(s):** Universitätsklinik für Allgemein-, Viszeral- und Thoraxchirurgie der Ruhr Universität Bochum, Universitätsklinik für Allgemein-, Viszeral- und Thoraxchirurgie der Ruhr Universität Bochum, Universitätsklinik für Allgemein-, Viszeral- und Thoraxchirurgie der Ruhr Universität Bochum, Universitätsklinik für Allgemein-, Viszeral- und Thoraxchirurgie der Ruhr Universität Bochum, Klinik für diagnostische und interventionelle Radiologie und Neuroradiologie

**Country:** Germany, Germany, Germany, Germany, Germany

## Introduction

Focal nodular hyperplasia (FNH) is the second frequent benign tumour of the liver. It affects more frequently females (80%) and may be exacerbated via oral contraceptives. Usual size is smaller than 5 cm and they occur near the liver surface. It arises from a vascular malformation. Some FNH occurs in association with hepatocellular adenoma and therefore growth is suspicious for hepatocellular carcinoma.(1, 2)

Here we show a case of a 19-year-old female with a FNA centrally located within the right liver lobe. The young woman suffers from epigastric abdominal pain. Due to repressing growth of this 12 cm measuring lesion, it stretches out and represses main vessels of the right liver lobe. Surgery was performed after preceding trans arterial embolization.

## Materials & Methods

Histopathological diagnosis was confirmed via 16 Gage fine needle biopsy in 19-year-old healthy woman with a BMI of 22,5. Precondition of the tumour was done by trans arterial embolization in a super selective way. A 6 French liver catheter lock was placed in A. femoralis communis right. Polyvinyl alcohol microspheres were used as occluding particles: Bead Block® 100-300µm (Boston Scientific Medizintechnik GmbH, Düsseldorf, Germany) and Embosphere® Microspheres 100-300µm (Meritmedical, Salt Lake City, Utah, USA). Embolization was done three times at intervals of 6 weeks.

Operation was done in a conventional way via a subcostal incision 10 weeks after trans arterial embolization. After simultaneously cholecystectomy, control of hepatic inflow was gained via selective Pringle manoeuvre of A. hepatis communis and V. portae. Right and middle hepatic liver veins also were secured by application of vessel-reins. Resection of the tumour was done via parenchyma sparing technic. ERBEJET 2® (Erbe Elektromedizin GmbH, Tübingen, Germany) and partially gently manual preparation technique was used for enucleation of the tumour by dissection within the fibrotic plane, enclosing the FNA.

## Results

Trans arterial embolization decreased longitudinal size of the tumour from 118 mm to 78 mm.

Surgery proceeded without complications, estimated intraoperative blood-loss was 100ml, no transfusion was required. No signs of liver failure were recognized during postoperative stay. No biliary leakage or hematoma was detected. No surgical site infection occurred. Value of LiMAx-test(3) preoperative was 324 µg/h/kg and 315 µg/h/kg at 6th postoperative day [ref>315 µg/h/kg].

Examination of the histopathological specimen confirmed diagnosis and verified complete resection. Patient was dismissed at day 7 after operation. Short-term follow-up 3 month postoperative via MRI showed no fluid retention or tumour-recurrency.

## Summary

It is feasible to resect giant FNH without extended loss of liver parenchyma. For this a multidisciplinary approach is recommended, to induce shrinkage of the tumour via interventional treatment following predetermined layers respecting surgical technique.

## Literature

1. Roncalli M, Sciarra A, Tommaso LD. Benign hepatocellular nodules of healthy liver: focal nodular hyperplasia and hepatocellular adenoma. *Clin Mol Hepatol*. 2016;22(2):199-211.
2. Myers L, Ahn J. Focal Nodular Hyperplasia and Hepatic Adenoma: Evaluation and Management. *Clin Liver Dis*. 2020;24(3):389-403.
3. Stockmann M, Lock JF, Malinowski M, Niehues SM, Seehofer D, Neuhaus P. The LiMAx test: a new liver function test for predicting postoperative outcome in liver surgery. *HPB (Oxford)*. 2010;12(2):139-46.

# Abstract Information

No.: E23-248 | submitted: September 1, 2023 at 7:28 pm

## Key Facts

**Titel:** Laparoscopic liver tunnel for colorectal liver metastases

**Topic:** Minimally invasive/robotic liver surgery

**Format:** Video (max. 3-5 minutes)

## Author(s)

**Name(s):** Roberto Lo Tesoriere, Nadia Russolillo, Andrea Pierluigi Fontana, Rebecca Panconesi, Marsia Tancredi, Alessandro Ferrero

**Institute(s):** Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I, Department of General and Oncological Surgery, Ospedale Mauriziano Umberto I

**Country:** Italy, Italy, Italy, Italy, Italy, Italy

## Introduction

Tumors involving at the hepatocaval confluence often require major or extended hepatectomies. The “Liver Tunnel” was described for the conservative resection of tumors involving Sg1, S4ga and Sg8, infiltrating or in contact with the middle hepatic vein at the hepatocaval confluence, thus offering the advantages of parenchyma-sparing surgery also for deeply located tumors with complex anatomical relations. Laparoscopic liver surgery is constantly evolving and is gradually achieving the goals of open surgery both in terms of major resections and of complex parenchymal-sparing surgery.

The video shows a “Liver Tunnel” procedure performed with a complete minimally invasive approach in a 48 year-old woman with 2 colorectal liver metastases in the paracaval portion of Sg1 and in Sg 8 ventral.

## Materials & Methods

The operation begins with the isolation of the left portion of Sg1. The Glissonian pedicles are divided intraparenchymally. The short hepatic vein draining Sg1 are then divided. The parenchymal section is carried with cranio-caudal approach to the middle hepatic vein from the dorsal side. The resection is then carried on the ventral side. A liver map of the anatomical structures involved in the resection is sketched on the liver surface and the resection is carried with a cranio-caudal approach to the middle hepatic vein on the ventral side. The right anterior Glissonian pedicle is dissected and Sg8 ventral pedicles are divided. Indocyanine green negative staining allows a precise dissection in the deep parenchyma.

## Results

The postoperative course was uneventful, and the patient was discharged on postoperative day 4.

## Summary

The “Liver Tunnel” can be performed with a minimally invasive approach thanks to an accurate technique and intensive use of intraoperative ultrasonography.

## Literature

Torzilli G, Garancini M, Donadon M, Cimino M, Procopio F, Montorsi M. Intraoperative ultrasonographic detection of communicating veins between adjacent hepatic veins during hepatectomy for tumours at the hepatocaval confluence. *Br J Surg.* 2010;97(12):1867-1873. doi:10.1002/bjs.7230

Lo Tesoriere R, Forchino F, Fracasso M, Russolillo N, Langella S, Ferrero A. Color Doppler Intraoperative Ultrasonography Evaluation of Hepatic Hemodynamics for Laparoscopic Parenchyma-Sparing Liver Resections. *J Gastrointest Surg.* 2022;26(10):2111-2118. doi:10.1007/s11605-022-05430-w

Torzilli G, Cimino M, Procopio F, et al. Conservative hepatectomy for tumors involving the middle hepatic vein and segment 1: the liver tunnel. *Ann Surg Oncol.* 2014;21(8):2699. doi:10.1245/s10434-014-3675-9

Ferrero A, Lo Tesoriere R, Russolillo N. Ultrasound Liver Map Technique for Laparoscopic Liver Resections. *World J Surg.* 2019;43(10):2607-2611. doi:10.1007/s00268-019-05046-3

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# Abstract Information

No.: E23-252 | submitted: September 1, 2023 at 8:20 pm

## Key Facts

**Titel:** Liver surgery in Hepatocellular Carcinoma – Initial Single Center Experience

**Topic:** Multimodal therapy of HCC

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Nádía Tenreiro, André Marçal, Tiago Pinto Castro

**Institute(s):** CHTMAD, CHTMAD, CHTMAD

**Country:** Portugal, Portugal, Portugal

## Introduction

Hepatocellular carcinoma (HCC) is the dominant type of liver cancer, and its incidence is increasing globally; being the 5th most diagnosed cancer in 2020 (1,2).

In our institution, a 400-bed tertiary hospital, a growing demand for oncological liver surgery has been seen in the last few years. In collaboration with a previously existing hepatology clinic, a HPB surgery unit was formed in 2020.

We present our initial results of liver surgery in HCC patients.

## Materials & Methods

Inclusion of all patients that underwent liver surgery for confirmed or suspected HCC in our institution from January 2020 to December 2022. Data collection was performed retrospectively, including liver disease stratification, textbook outcomes (3) and oncological variables. A descriptive statistical analysis assuming a non-normal distribution and survival curves (Kaplan-Meier) was obtained using SPSS®.

## Results

We included 37 patients who underwent liver surgery for HCC, 36 of whom had liver cirrhosis, with a median pre-operative MELD score of 9. We performed 30% anatomical resections and 26% laparoscopic surgeries with a median hospital length of stay of 6 days. Most of our patients were classified as having AJCC stage 1 HCC and BCLC stage A disease.

We report two patients with clinically significant post-operative complications (bile leak), two patients with decompensated cirrhosis, and two patients with an R1 resection. We had six 90-day readmissions and no 90-day mortality.

## Summary

Our initial results show that liver surgery in smaller hospitals can be safely performed in selected cases, provided a multidisciplinary team is available.

Overall, our study showed positive outcomes for the majority of patients who underwent liver surgery for HCC. However, it is important to note that a small number of patients experienced complications. These complications were managed promptly and effectively, minimizing their impact on the patients' overall prognosis.

## Literature

1- McGlynn KA, Petrick JL, El-Serag HB. Epidemiology of Hepatocellular Carcinoma. *Hepatology*. 2021 Jan;73 Suppl 1(Suppl 1):4-13. doi: 10.1002/hep.31288.

2 – Globocan 2020. International Agency for Research on Cancer 2023. <https://gco.iarc.fr/>

3 – Görgec B, Cacciaguerra AB, Pawlik TM, et al. An International Expert Delphi Consensus on Defining Textbook Outcome in Liver Surgery (TOLS). *Ann Surg*. 2022 Aug 10;277(5):821–8. doi: 10.1097/SLA.0000000000005668.

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# Abstract Information

No.: E23-266 | submitted: September 1, 2023 at 9:28 pm

## Key Facts

**Title:** Fibrolamellar Carcinoma – a case report

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Nádía Tenreiro, André Marçal, Tiago Pinto Castro

**Institute(s):** CHTMAD, CHTMAD, CHTMAD

**Country:** Portugal, Portugal, Portugal

## Introduction

Fibrolamellar carcinoma (FLC) is a rare primary liver tumor, accounting for less than 1% of all liver cancers. This rarity sets FLC apart from more common liver tumors such as hepatocellular carcinoma (HCC). Understanding the unique characteristics of FLC is crucial for accurate diagnosis and appropriate treatment decisions. Patients with FLC tend to be younger and have a generally better prognosis. FLC is also rarely associated with cirrhosis or chronic liver disease, but some reports have suggested a possible hepatitis B virus (HBV) etiology. FLC tumor cells have markers of both hepatocyte and biliary differentiation, and only a minority show elevated alpha-fetoprotein (AFP) levels. Though cross-sectional imaging results may be strongly suggestive of FLC, histologic confirmation is needed.

## Materials & Methods

### Case Report

## Results

We present the case of a 56-year-old male with chronic liver disease (F3) secondary to chronic HBV hepatitis and alcohol under antiretroviral treatment with tenofovir.

In screening ultrasonography, a 10 mm non-specific liver nodule was identified and classified as LiRADS 3 by hepatic CT and MRI; alpha fetoprotein was 5.4 ng/mL. He was scheduled to repeat imaging but was lost to follow-up. He subsequently returned to the hepatology clinic a year later and repeated the CT scan with an increase in size but still lacking specific HCC characteristics. He underwent a percutaneous biopsy that was consistent with fibrolamellar carcinoma.

A ventral segment 8 resection with hepatoduodenal lymph node dissection was performed. Pathology confirmed an AJCC/UICC pT1bN0 FL-HCC. The patient had no post-operative complications and has no evidence of disease recurrence at 1-year follow-up.

## Summary

FLC is a rare liver cancer and its biology is still not clear. Although patients with FLC often have advanced disease at diagnosis, complete resection is the only potentially curative option. Patients undergoing resection may also benefit from concomitant regional lymphadenectomy, though this has not been demonstrated in some series. Studies have shown that patients with FLC generally have a better prognosis compared to other liver tumors, with a 5-year survival rate of around 60–70%.

In our case, a resectable FLC in a chronic HBV patient was diagnosed and surgically treated with curative intent.

## Literature

Aloysius MM, Iskander P, Ahmed K, Asija U, Mohammed E, Iskander A, Shah NJ, Goyal H, Khurana V, Simin N, Aswath G, John S. Fibrolamellar hepatocellular carcinoma: An epidemiologic and 5-year cancer survival assessment based off SEER data. *Clin Res Hepatol Gastroenterol*. 2023 Aug;47(7):102162. doi: 10.1016/j.clinre.2023.102162.

Aziz H, Brown ZJ, Panid Madani S, Kamel IR, Pawlik TM. Fibrolamellar Hepatocellular Carcinoma: Comprehensive Review of Diagnosis, Imaging, and Management. *J Am Coll Surg*. 2023 Feb 1;236(2):399-410. doi: 10.1097/XCS.0000000000000476.

Smith M, Tomboc PJ, Markovich B. Fibrolamellar Hepatocellular Carcinoma. 2022 Sep 26. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2023 Jan–.

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## Introduction

A standardized future liver remnant (sFLR) <30% and a kinetic growth rate (KGR) <2% are associated with increased risk of hepatic insufficiency and death from liver failure after hepatectomy. Here, we sought to identify clinicopathologic factors associated with inadequate sFLR and KGR to help predict which patients may not achieve sufficient hypertrophy with portal vein embolization (PVE) alone and inform selection for liver venous deprivation (LVD).

## Materials & Methods

A prospectively maintained single-institution database was evaluated for patients undergoing PVE between 1998 and 2020. Clinicopathologic variables, including age, sex, BMI, a known diagnosis of liver disease, diabetes, cycles of neoadjuvant chemotherapy, liver function tests, baseline sFLR, and extended PVE (segment 4 embolization) were evaluated for associations with sFLR and KGR.

## Results

A total of 477 patients were identified. Median (IQR) patient age was 58 (49-65) years, and the most common histology was metastatic colorectal cancer (317 patients; 67%). A total of 364 patients (76%) received neoadjuvant systemic therapy prior to PVE (median [IQR], 7 cycles [4-11]). The median baseline sFLR was 22% (16%-29%). Of the 477 patients, 284 (60%) achieved an sFLR of at least 30% following PVE, while 271 (57%) achieved a KGR of at least 2% per week. Three hundred sixty patients (76%) ultimately underwent the planned surgical intervention. Multiple logistic regression revealed that higher pre-PVE sFLR (odds ratio [OR], 1.4; 95% CI, 1.31-1.49) was predictive of a post-PVE sFLR of at least 30%, while weight gain after PVE (OR, 0.46; 95% CI, 0.28-0.75) and planned staged resection (OR, 0.45; 95% CI, 0.30-0.67) were predictive of failure to achieve a KGR of at least 2% per week. Receiver operating characteristic curve analysis revealed that a pre-PVE sFLR of greater than 19% was 89% sensitive and 75% specific for an sFLR of at least 30% (area under the curve, 0.91). Among the 165 patients with a pre-PVE sFLR of at least 26%, 97% achieved adequate hypertrophy with PVE alone.

## Summary

Patients with a baseline sFLR of less than 19% or planned staged hepatectomy may not achieve adequate liver remnant hypertrophy with PVE alone and should be considered for LVD or other procedures to augment hypertrophy. Healthy weight maintenance should be encouraged after PVE to optimize liver regeneration.

## Literature

1. Vauthey JN, Chaoui A, Do KA, et al. Standardized measurement of the future liver remnant prior to extended liver resection: methodology and clinical associations. *Surgery*. 2000;127(5):512-519. doi:10.1067/msy.2000.105294
  2. Shindoh J, Tzeng CW, Aloia TA, et al. Optimal future liver remnant in patients treated with extensive preoperative chemotherapy for colorectal liver metastases. *Ann Surg Oncol*. 2013;20(8):2493-2500. doi:10.1245/s10434-012-2864-7
  3. Shindoh J, Truty MJ, Aloia TA, et al. Kinetic growth rate after portal vein embolization predicts posthepatectomy outcomes: toward zero liver-related mortality in patients with colorectal liver metastases and small future liver remnant. *J Am Coll Surg*. 2013;216(2):201-209. doi:10.1016/j.jamcollsurg.2012.10.018
  4. Niekamp AS, Huang SY, Mahvash A, et al. Hepatic vein embolization after portal vein embolization to induce additional liver hypertrophy in patients with metastatic colorectal carcinoma. *Eur Radiol*. 2020;30(7):3862-3868. doi:10.1007/s00330-020-06746-4
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# Abstract Information

No.: E23-289 | submitted: September 2, 2023 at 4:42 pm

## Key Facts

**Titel:** ABILITY OF 3-D LIVER RECONSTRUCTION SOFTWARE TO ESTIMATE THE LIVER RESECTIONS VOLUME AFTER ANATOMICAL MINOR RESECTIONS: A PROSPECTIVE STUDY

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Nadia Russolillo, Andrea P. Fontana, Serena Langella, Roberto Lo Tesoriere, Caterina C. Zingaretti, Alessandro Ferrero

**Institute(s):** Ordine Mauriziano Hospital, Turin, Ordine Mauriziano Hospital, Turin, Ordine Mauriziano Hospital, Turin, Ordine Mauriziano Hospital, Turin, Ordine Mauriziano Hospital, Turin, Ordine Mauriziano Hospital, Turin

**Country:** Italy, Italy, Italy, Italy, Italy, Italy

## Introduction

Estimation of liver resection volume (LRV) represents a key step to plane safe liver surgery. Modern 3D liver reconstruction software (3-D) allows to calculate LRV based on the portal blood supply, overcoming some limits of the conventional hand-trace method. The aim of this prospective study was to evaluate the ability of 3-D to estimate the LRV after anatomical minor resections (AmR).

## Materials & Methods

To get 95% confidence level, with a standard deviation of 10 mL a sample size of 35 patients was needed. The consistency of virtual LRV (vLRV) and real weighted specimen (rLRV) were evaluated. Factors affecting the median discrepancy between vLRV and rLRV were analyzed. Exclusion criteria were left lateral sectionectomy and change of surgical plane according to intraoperative ultrasound findings.

## Results

35 consecutive AmR were analyzed: 4 sub-segmentectomies, 9 segmentectomies and 22 bisegmentectomies. There was a strong positive correlation between vLRV and rLRV ( $r=0.945$ ,  $p>0.001$ ). Median vLRV and rLRV were 236 ml and 180 m. The median discrepancy between vLRV and rLRV was  $-38$  mL indicating a slightly tendence to overestimate LRV of 3D software. The median discrepancy was higher in cases of large subglissonian lesion ( $>3$  cm) (65 mL vs 22.5 mL other type of lesions,  $p=0.028$ ) and bisegmentectomies (60.5 mL vs. 16 mL of segmentectomies/subsegmentectomies,  $p=0.001$ ).

## Summary

3D software showed accurate prediction of liver specimen volume in patients who underwent anatomical minor resections.

## Literature

Jihua Jiang Lei Pei, Renya Jiang. Clinical efficacy and safety of 3D vascular reconstruction combined with 3D navigation in laparoscopic hepatectomy: systematic review and meta-analysis. J Gastrointest Oncol 2022;13(3):1215-1223

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# Abstract Information

No.: E23-298 | submitted: September 15, 2023 at 11:22 am

## Key Facts

**Title:** Robotic complete ALPPS (rALPPS)-first German experiences

**Topic:** Minimally invasive/robotic liver surgery

**Format:** ePoster

## Author(s)

**Name(s):** Joerg Arend, Mareike Franz, Alexander Rose, Christine March, Mirhasan Rahimli, Aristotelis Perrakis, Erik Lorenz, Roland S Croner

**Institute(s):** University Hospital Magdeburg, University Hospital Magdeburg, University Hospital Magdeburg, University Hospital Magdeburg, University Hospital Magdeburg, University Hospital Magdeburg, University Hospital Magdeburg

**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

ALPPS leads to fast and effective liver hypertrophy. This enables resection of extended tumors. Conventional ALPPS is associated with high morbidity and mortality. MILS reduces the morbidity and the robot adds technical features which makes complex procedures save.

## Materials & Methods

The MD-MILS was screened for patients which underwent rALPPS. Demographic and perioperative data were evaluated retrospectively. Ninety days postoperative morbidity was scored regarding the CD classification. The findings were compared with the literature.

## Results

Between 2021-2022 five patients were identified. The mean age and BMI of the patients was 50.0 years and 22.7 kg/m<sup>2</sup>. In four cases patients suffered from colorectal liver metastases and in one from intrahepatic cholangiocarcinoma. Prior to the first operation the mean liver volume of the residual left liver was 380.9 ml with a FLR-BWR 0.677%. Prior to the second operation the mean volume of the residual liver was 529.8 ml with a FLR-BWR of 0.947%. This was an increase of 41.9% of the residual liver volume. First and second operation were carried out within 17.8 days. The mean time of the first and second operation was 341.2 min and 440.6 min. The mean hospital stay was 27.2 days. Histopathology showed a largest tumor size of 39mm in diameter with a mean amount of 4.7 tumors. The mean tumor free margin was 12.3 mm. One complication (1/10 operations, 10%) CD ? 3a occurred. No patient died within 90 days of during follow up.

## Summary

In a first German series we could demonstrate that rALPPS can be carried out safe with reduced morbidity and mortality in selected patients.

## Literature

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- [25] R. Croner u. a., „Roboterassistierte Hemihepatektomie rechts“, *Zentralbl Chir*, Bd. 146, Nr. 03, S. 235–238, Juni 2021, doi: 10.1055/a-1217-0791.
- [47] L. Zhang, Q. Yuan, Y. Xu, und W. Wang, „Comparative clinical outcomes of robot-assisted liver resection versus laparoscopic liver resection: A meta-analysis“, *PLoS One*, Bd. 15, Nr. 10, S. e0240593, 2020, doi: 10.1371/journal.pone.0240593.
- [51] D. Coletta, G. B. Levi Sandri, G. Giuliani, und F. Guerra, „Robot?assisted versus conventional laparoscopic major hepatectomies: Systematic review with meta?analysis“, *Int J Med Robot*, Bd. 17, Nr. 3, Juni 2021, doi: 10.1002/rcs.2218.
- [53] E. Balli u. a., „Associating liver partition and portal vein ligation for staged hepatectomy in patients with primary liver malignancies: A systematic review of the literature“, *J BUON*, Bd. 24, Nr. 4, S. 1371–1381, 2019.
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# Abstract Information

No.: E23-315 | submitted: September 18, 2023 at 11:01 pm

## Key Facts

**Titel:** The trajectory of anti-recEm18 antibody levels determines follow-up after curative resection of hepatic alveolar echinococcosis

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** S. Gloor, M. H. Maurer, B. Gottstein, A. Oberli, J. B. Hagemann, J. F. Hotz, D. Candinas, A. Lachenmayer, B. Grüner, G. Beldi

**Institute(s):** Department of Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, Department for Diagnostic, Interventional, and Paediatric Radiology, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, Institute of Parasitology, Department of Infectious Diseases and Pathobiology, Vetsuisse Faculty, University of Bern, Bern, Switzerland, Institute for Infectious Diseases, Medical Faculty, University of Bern, Bern, Switzerland, Institute of Medical Microbiology and Hygiene, University Hospital of Ulm, Ulm, Germany, Department of Internal Medicine III, Division of Infectious Diseases, University Hospital of Ulm, Ulm, Germany, Department of Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, Department of Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland, Department of Internal Medicine III, Division of Infectious Diseases, University Hospital of Ulm, Ulm, Germany, Department of Visceral Surgery and Medicine, Inselspital, Bern University Hospital, University of Bern, Bern, Switzerland

**Country:** Switzerland, Switzerland, Switzerland, Switzerland, Germany, Germany, Switzerland, Switzerland, Germany, Switzerland

## Introduction

The study aimed to evaluate the use of anti-recEm18 for post-surgical monitoring in hepatic alveolar echinococcosis patients. Serology, particularly assessing anti-recEm18 antibodies, is available for diagnosis and follow-up, but it alone lacks sensitivity (80% to 94%). It's typically used alongside imaging and other serology tests (EgHF-ELISA, Em2-ELISA, EmVF-Westernblot) for AE diagnosis. Beyond diagnosis, anti-recEm18 may aid in AE patient follow-up after surgery due to its connection with parasite burden and viability. Studies support its potential for predicting metacestode viability, but these studies had limited patient numbers, included cystic echinococcosis cases and had imprecise follow-up timing.

Hence, this study sought to determine if recEm18-ELISA can effectively monitor post-surgical AE patients, establish threshold values, and identify necessary follow-up timeframes to rule out disease recurrence.

## Materials & Methods

This retrospective trial involved patients with hepatic alveolar echinococcosis (AE) from Bern University Hospital in Switzerland and the University Hospital and Medical Center Ulm in Germany. The inclusion criteria were adult patients over the age of 18, who underwent hepatic resection in curative intent for AE and the availability of at least one preoperative, one postoperative value of anti-recEm18 and a follow-up of at least 12 months. Patients with resectable extrahepatic lesions were also included. None of the patients had documented objection to use of healthcare related data.

Among 155 AE patients in Bern (2002-2020), 95 had surgery, excluding 36 due to missing data or <1-year follow-up. In Ulm (2011-2017), 52 of 124 AE patients had surgery, excluding 23 for the same reasons. This study included 59 Bern and 29 Ulm surgery patients with pre- and postoperative anti-recEm18 values.

AE diagnosis was confirmed by histopathology. Serological and disease recurrence data were collected for all 88 patients. Clinicopathological data from both centers included demographics, radiology, treatments, surgical details, and postoperative complications.

## Results

Anti-recEm18 had a linear correlation to the maximum lesion diameter ( $R^2 = 0.558$ ). Three trajectories of anti-recEm18 were identified based on a threshold of 10 AU/ml: "Em18-low" ( $n = 31$ ), "responders" ( $n = 53$ ) and "residual disease" ( $n = 4$ ). The "responders" experienced a significant drop in anti-recEm18 levels, while the "residual disease" group maintained strongly positive anti-recEm18 levels. In the Bern cohort, 58% of "responders" dropped below 10 AU/ml at 12 months, increasing to 94% at later time points (mean 16 months), with a mean decrease of 90% at 10.9 months. In the Ulm cohort, the 19 "responders" experienced a rapid anti-recEm18 decrease within the first 24 months. Two patients (11%) reached levels below 10 AU/ml at 12 months, and all 19 patients (100%) achieved this at later time points (mean 24 months), with a 90% decline within 23.3 months, followed by consistently low values during long-term follow-up. Across the entire cohort, one recurrence was observed 7 years post-resection. This patient had negative anti-recEm18 serology at 16 months, gradually increasing to 8 AU/ml.

## Summary

Taken together, the results indicate that recEm18 antibody levels can be used for postoperative surveillance in immunocompetent AE patients with preoperatively elevated anti-recEm18 levels. We propose that the trajectory of anti-recEm18, integrating preoperative and postoperative values identifies patients at high or low risk for recurrence. In patients with elevated preoperative anti-recEm18 values, measurement of anti-recEm18 after 6 and 12 months and annually thereafter is sufficient for long-term follow-up. This approach also contributes to the development of a new algorithm for monitoring AE patients in the long-term.

## Literature

- Brunetti E et al. Writing Panel for the W-I. Expert consensus for the diagnosis and treatment of cystic and alveolar echinococcosis in humans. *Acta tropica*. 2010;114(1):1-16.
- Kawamura N et al. Long-term results of hepatectomy for patients with alveolar echinococcosis: a single-center experience. *Journal of the American College of Surgeons*. 2011;212(5):804-12.
- Bellanger AP, Wang J, Gbaguidi-Haore H, Barrera C, Bresson-Hadni S, Zlobec I, et al. Investigating new serological and tissue markers for the follow-up of patients operated for alveolar echinococcosis. *Parasite Immunol*. 2021;43(6):e12827.
- Gottstein B, Lachenmayer A, Beldi G, Wang J, Merkle B, Vu XL, et al. Diagnostic and follow-up performance of serological tests for different forms/courses of alveolar echinococcosis. *Food and Waterborne Parasitology*. 2019;16.
- Sako Y, Tappe D, Fukuda K, Kobayashi Y, Itoh S, Frosch M, et al. Immunochromatographic test with recombinant Em18 antigen for the follow-up study of alveolar echinococcosis. *Clin Vaccine Immunol*. 2011;18(8):1302-5.

# Abstract Information

No.: E23-321 | submitted: September 19, 2023 at 8:27 am

## Key Facts

**Titel:** Safety and Feasibility of Robotic Lymph Nodes Dissection of The Liver Hilum

**Topic:** Minimally invasive/robotic liver surgery

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** AHMAD MAHAMID, Reem Gawi, Samar Mattar, Dvir Froylich, Riad Haddad

**Institute(s):** Carmel Medical Center, Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel., Carmel Medical Center, Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel., Carmel Medical Center, Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel., Carmel Medical Center, Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel., Carmel Medical Center, Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, Israel.

**Country:** Israel, Israel, Israel, Israel, Israel



## Introduction

Robotic liver resection has engendered growing attention as a safe procedure. However, there is little data available regarding the outcomes of robotic liver hilar lymphadenectomy (RLHL). The objective was to analyze the feasibility, and the safety of RLHL.

## Materials & Methods

A retrospective study of 9 consecutive patients who underwent RLHL since the recent implementation of the Da Vinci Xi surgical system in our hospital. Patients were divided based on the console time experience. Group 1 consisted of patients in the early half while Group 2 included patients in the late half.

## Results

Of 9 patients, 4 were in group (1), 5 were in group (2). No significant differences were found in terms of: age ( $p = 0.35$ ), BMI ( $p = 0.07$ ), gender ( $p = 0.17$ ), indication for surgery ( $p = 0.06$ ), liver resection types ( $p = 0.23$ ), complication rates ( $p = 0.4$ ), length of stay ( $p = 0.95$ ), and number of harvested lymph nodes ( $p = 0.4$ ). However, Group 1 had a mean console time of 155+34 minutes, while Group 2 had a mean console time of 92+11 minutes, demonstrating a statistically significant difference ( $p = 0.006$ ) (Figure / Table 1).

## Summary

RLHL is a feasible and safe procedure. The significantly different console times between the groups suggest strong correlation with the surgeon's overall console time experience. RLHL can be considered as an alternative to open and laparoscopic approaches for liver hilar lymphadenectomy. However, further studies are warranted to explore the long-term outcomes and benefits of RLHL compared to other surgical approaches.

## Literature

none

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# Abstract Information

No.: E23-333 | submitted: September 22, 2023 at 9:50 am

## Key Facts

**Title:** An Unconventional Approach to Multimodality Treatment in HCC

**Topic:** Multimodal therapy of HCC

**Format:** ePoster

## Author(s)

**Name(s):** Tiago Pinto Castro, André Marçal, Nádia Tenreiro

**Institute(s):** CHTMAD, CHTMAD, CHTMAD

**Country:** Portugal, Portugal, Portugal

## Introduction

Surgical therapy offers the best long term survival in hepatocellular carcinoma (HCC) and it should always be considered even after non-curative therapies such as systemic treatment or transarterial chemoembolization (TACE). BCLC staging system remains a widely used approach but it undervalues the benefits of surgery in some stages, restricting resection to a very limited number of cases.

In patients that initially are not surgical candidates, re-evaluation should be done after other treatment modalities.

## Materials & Methods

Case Report

## Results

69-year-old male with hepatocellular carcinoma diagnosed in 2021 (Chronic Liver Disease F3-F4 Secondary to Hepatitis C Virus and Alcohol).

Initially, with a single 83 x 78 mm lesion in Sg 4, surgery was decided against in MDT meeting with reference centre due to suspicion of multifocality. He was then submitted to TACE and started on sorafenib, which he only maintained for 7 months as he developed cardiovascular side effects. He then switched to nivolumab and ipilimumab, initially with good tolerability and a biochemical response.

Imaging at 1 year after diagnosis showed downsizing and no evidence of multifocality, and he was proposed for surgery. He underwent sg 4 segmentectomy, without complications. Histology showed ypT1aNxMx, with clear surgical margins.

At the last follow-up, 1 year after surgery, the patient was well with no evidence of disease recurrence.

## Summary

Modern treatments improved results in patients with HCC. In early stages of HCC curative treatment is possible. In advanced disease, local chemotherapy and systemic targeted therapy have prolonged survival, but surgery should always remain an option in resectable disease with adequate liver function.

## Literature

Reig M, Forner A, Rimola J, Ferrer-Fàbrega J, Burrel M, Garcia-Criado Á, Kelley RK, Galle PR, Mazzaferro V, Salem R, Sangro B, Singal AG, Vogel A, Fuster J, Ayuso C, Bruix J. BCLC strategy for prognosis prediction and treatment recommendation: The 2022 update. *J Hepatol.* 2022 Mar;76(3):681-693. doi: 10.1016/j.jhep.2021.11.018.

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# Abstract Information

No.: E23-353 | submitted: September 24, 2023 at 10:25 am

## Key Facts

**Titel:** Retrospective Evaluation of the Efficacy of Preoperative Chemotherapy for Liver Metastases of Colorectal Cancer

**Topic:** Multimodal therapy of liver metastases

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Yui Sawa, Yoshikuni Kawaguchi, Yuhi Yoshizaki, Akinori Miyata, Yujiro Nishioka, Akihiko Ichida, Junichi Kaneko, Nobuhisa Akamatsu, Kiyoshi Hasegawa

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**Country:** Japan, Japan, Japan, Japan, Japan, Japan, Japan, Japan, Japan, Japan

## Introduction

Patients with colorectal liver metastases (CLMs) need multimodal treatment approach. For patients with resectable CLMs, a combination of both surgical and medical treatments is important to prevent recurrence and improve overall survival (OS). ESMO guideline states that perioperative chemotherapy (with the regimen of FOLFOX or CAPOX) should be administered in patients with a technically resectable disease associated with poor prognosis. In contrast, the Japanese Society for Cancer of the Colon and Rectum guide-lines recommend no use of prehepatectomy chemotherapy in patients with resectable CLMs because of the limited evidence supporting the efficacy of prehepatectomy chemotherapy. It remains unclear whether preoperative chemotherapy improves prognosis. We evaluated the efficacy of prehepatectomy chemotherapy compared with posthepatectomy chemotherapy or surgery alone.

## Materials & Methods

A retrospectively compiled database was searched to identify patients who are diagnosed with CLM and underwent liver resection or chemotherapy at The University of Tokyo from January 2005 to June 2022. Patients undergoing a first liver resection or chemotherapy for CLM were included for analysis. To assess the impact of radiologic tumor characteristics, patients without radiologic information were excluded. We divided patients with CLM into the following 3 groups by image evaluation of computed tomography or magnetic resonance imaging at the time of diagnosis of CLM. Resectable Oncological Good (R-OG) including patients with less than 5 CLMs without extra-hepatic metastases, Resectable Oncological Bad (R-OB) including patients with five or more CLMs or resectable extrahepatic metastases, and Unresectable (UR) including patients with unresectable CLMs or unresectable extrahepatic metastases. OS were compared.

## Results

Of 942 patients who were diagnosed with CLM and treated by liver resection or chemotherapy during the study period, 588 patients were included in the analysis. Of the 588 patients, 333 were classified as the R-OG group, 143 were classified as the R-OB group, and 112 were classified as the UR group. The 5-year OS rates were 70.8%, 49.0%, and 33.4% in the R-OG group, the R-OB group, and the UR group, respectively. OS was significantly worse in the R-OB group than in the R-OG group ( $P < 0.001$ ). OS was significantly better in the R-OB group than in the UR group ( $P = 0.008$ ). Of the 143 patients in the R-OB group, 70 patients underwent preoperative chemotherapy, and 73 patients underwent upfront surgery. The 5-year OS rates did not differ significantly between the preoperative chemotherapy group (49.1%) and the upfront surgery group (49.3%) ( $P = 0.571$ ). An IPTW analysis showed that the demographics was well balanced between the groups and that OS was not significantly different between the groups ( $P = 0.446$ ). For patients who were in the R-OB group and underwent prehepatectomy chemotherapy, the 5-year OS stratified by the NAC response rates was 62.0% for PR, 42.7% for SD, and 24.1% for PD.

## Summary

The prehepatectomy chemotherapy was not associated with improved OS in CLM patients who were suspected of poor prognosis according to the ESMO guideline. Treatment selection and criteria for prehepatectomy hepatectomy for resectable CLM needs to be established.

## Literature

None.

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# Abstract Information

No.: E23-377 | submitted: September 25, 2023 at 10:28 am

## Key Facts

**Titel:** Short-chain fatty acids and free fatty acid receptor agonists as a new experimental approach in hepatocellular carcinoma (HCC)?

**Topic:** Varia

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Luc Kohnen, Katrin Richter, Vijay Singh, Martin Reichert, Andreas Hecker, Martin Schneider, Juliane Liese

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**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Hepatocellular carcinoma (HCC) is the fourth leading cause for cancer-associated deaths worldwide. The lack of effective chemotherapies for HCC is still an unsolved problem. For decades short chain fatty acids have been known for their antiproliferative effects on various cancer entities in vitro. The aim of our study is to evaluate natural short chain fatty acids (SCFAs) and synthetic free fatty acid receptor (FFA) agonist as a new potential therapeutic strategy in HCC and to investigate the underlying mechanism of action.

## Materials & Methods

Experiments were performed in vitro on the two human HCC cell lines Huh7 and HepG2. Cell viability was determined by MTT assay and propidium iodide staining. In addition, FFA inhibitor experiments, reactive oxygen species (ROS)-mediated cell death, cell cycle arrest analysis, caspase-3/7 activity measurements and Western blot analyses were carried out. For evaluation a long-term effect of the SCFAs and synthetic FFA agonists, a colony formation assay was performed.

## Results

We were able to show that physiological concentrations of the SCFAs acetate, propionate, and butyrate as well as FFA agonists AR420626 and 4-CMTB have an antiproliferative effect on HepG2 and Huh7 cells by inducing cell cycle arrest and suppress long-term clonogenic survival. Kinetic analysis showed an induction of cell death after 24 h. In contrast to previous studies, neither butyrate nor AR420626 showed an induction of the ROS system and cell death could not be prevented by ROS scavengers. Interestingly, the SCFA-induced cell death seems to be caspase independent.

## Summary

In conclusion, we provide evidence that SCFAs as well as synthetic FFA-agonists induce cell cycle arrest in human HCC cell lines and, thus, have a therapeutic potential to overcome chemotherapy resistance in HCC. The exact molecular mechanisms deserve further investigations.

## Literature

Hajjar, R. et al. Am J Physiol Gastrointest Liver Physiol. 2021

Zhu, X. et al. Gut Microbes.2023

Nouso, K. et al. Cancer Medicine 2023

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# Abstract Information

No.: E23-383 | submitted: September 25, 2023 at 4:31 pm

## Key Facts

**Titel:** Full robotic two-stage hepatectomy; redefining the course of liver surgery

**Topic:** Minimally invasive/robotic liver surgery

**Format:** Oral presentation (free paper)

## Author(s)

**Name(s):** Shadi Katou, Haluk Morgül, Andreas Andreou, Andreas Pascher, Benjamin Strücker

**Institute(s):** University Hospital of Münster, University Hospital of Münster, University Hospital of Münster, University Hospital of Münster, University Hospital of Münster

**Country:** Germany, Germany, Germany, Germany, Germany

## Introduction

Robotic liver surgery has been shown as a safe and feasible approach with comparable oncologic outcome to open surgery. The implementation of robotic liver resection for complex and two-stage hepatectomy is being increasingly favored, as those patients benefit the most of the robotic approach.

## Materials & Methods

We present a case series of four patient assigned for two-stage liver resection at our center. The surgeries were all carried out with a full robotic approach between May and September 2023. Future liver remnant volume was calculated based on CT scans and all cases were preoperatively discussed in an interdisciplinary HPB board.

## Results

All Patients were female and aged between 32 and 70 years. The Indications for surgery were Liver Adenoma, colorectal and anal cancer liver metastases. Three patients underwent an ALPPS procedure with a mean of 14.3 days between step 1 and 2. The 4th Patient had a conventional two- stage liver resection with 35 days between both steps. After 1st stage, none of the patients were admitted to ICU and three patients were discharged after a mean hospital duration of 7.6 days. Complications occurred only in one case, where a reoperation was required due to bile leak (Clavien dindo 3b). After 2nd stage, ICU administration rate was 75% but for only one day in all cases. Mean of hospital duration was 9.5 days and two patients had no complication whereas the others had either grad 2 (pneumonia) or 3a (perihepatic fluid and CT drain).

## Summary

Full Robotic two-stage hepatectomy is feasible and can be established at an experienced center, allowing even discharge of most patients between stages. We observed no mortality and a low major morbidity rates.

## Literature

Becker F, Morgül H, Katou S, Juratli M, Hölzen JP, Pascher A, Struecker B. Robotic Liver Surgery – Current Standards and Future Perspectives. *Z Gastroenterol.* 2021 Jan;59(1):56-62. English. doi: 10.1055/a-1329-3067. Epub 2021 Jan 11. PMID: 33429451.

Vicente E, Quijano Y, Ielpo B, Fabra I. First ALPPS procedure using a total robotic approach. *Surg Oncol.* 2016 Dec;25(4):457. doi: 10.1016/j.suronc.2015.10.001. Epub 2015 Nov 14. PMID: 26856770.

Di Benedetto F, Assirati G, Magistri P. Full robotic ALPPS for HCC with intrahepatic portal vein thrombosis. *Int J Med Robot.* 2020 Apr;16(2):e2087. doi: 10.1002/rcs.2087. Epub 2020 Feb 18. PMID: 32011081.

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## Introduction

Intrahepatic cholangiocarcinoma (ICC) is a rare malignancy. Besides tumor, nodal, and metastatic status, the UICC TNM classification describes further parameters such as lymphangio- (L0/L1), vascular (V0/V1/V2), and perineural invasion (Pn0/Pn1). The aim of this study was to analyze the influence of these parameters on recurrence and survival.

## Materials & Methods

All surgical explorations for patients with ICC between January 2008 and June 2018 were collected and further analyzed in our institutional database. Statistical analyses focused on perineural, lymphangio-, and vascular invasion examined histologically and their influence on tumor recurrence and survival.

## Results

Of 210 patients who underwent surgical exploration, 150 underwent curative-intended resection. Perineural invasion was present in 41, lymphangioinvasion in 21, and vascular invasion in 37 patients (V1 n = 34, V2 n = 3). Presence of P1, V+ and L1 was significantly associated with positivity of each other of these factors ( $p < 0.001$ , each). None of the three parameters showed direct influence on tumor recurrence in general, but perineural invasion influenced extrahepatic recurrence significantly ( $p = 0.019$ ). Whereas lymphangio and vascular invasion was neither associated with overall nor recurrence-free survival, perineural invasion was significantly associated with a poor 1-, 3- and 5-year overall survival (OS) of 80%, 35%, and 23% for Pn0 versus 75%, 23%, and 0% for Pn1 ( $p = 0.027$ ). Concerning recurrence-free survival (RFS), Pn0 showed a 1-, 3- and 5-year RFS of 42%, 18%, and 16% versus 28%, 11%, and 0% for Pn1, but no significance was reached ( $p = 0.091$ ).

## Summary

Whereas lymphangio- and vascular invasion showed no significant influence in several analyses, the presence of perineural invasion was associated with a significantly higher risk of extrahepatic tumor recurrence and worse overall survival.

## Literature

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# Abstract Information

No.: E23-434 | submitted: October 23, 2023 at 7:27 am

## Key Facts

**Titel:** Pharmacological preconditioning with cilostazol reverses steatosis prior to major hepatectomy and improves liver regeneration

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Sebastian Holländer, Maximilian von Heesen, Gereon Gäbelein, Antonios E. Spiliotis, Anna Simson, Julie Mercier, Ammar Al-Ali, Matthias W. Laschke, Michael D. Menger, Matthias Glanemann

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**Country:** Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany, Germany

## Introduction

Treatment with cilostazol, a phosphodiesterase-3 inhibitor, has previously been shown to reduce liver steatosis and enhance hepatic perfusion. We investigated the effects of cilostazol after major hepatectomy in a steatotic rat model.

## Materials & Methods

Six weeks prior to surgery, Sprague-Dawley rats were fed with a high-fructose (high-FRC) diet. The treatment group (n = 32) received daily oral cilostazol at 5 mg/kg, which was initiated seven days prior to hepatectomy and was continued throughout the postoperative period. The animals in the control group received water without cilostazol (n = 32). Seven days following the cilostazol treatment, all animals underwent 70% liver resection (PHX). Analysis of hepatic blood flow, hepatic microcirculation, and immunohistological examinations were conducted 30 minutes after PHX (postoperative day [POD] 0), on POD 1, POD 3, and POD 7.

## Results

The weight of animals treated with cilostazol was significantly reduced compared to untreated controls after completion of the 6-week high-FRC diet. Furthermore, 41% macrovesicular steatosis was found in the control group compared to 8% in the cilostazol group. Hepatic arterial and portal venous perfusion were increased in the cilostazol group on POD 7. Lower liver enzyme release was found on POD 0, POD 1 and POD 7 in the animals treated with cilostazol compared to controls. In the immunohistochemical analysis, apoptosis and the inflammatory response were reduced after cilostazol treatment. Proliferation of hepatocytes and liver regeneration after PHX were significantly increased in the cilostazol group.

## Summary

Pretreatment with cilostazol represents an effective pharmacological preconditioning prior to major hepatectomy.

## Literature

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# Abstract Information

No.: E23-440 | submitted: October 23, 2023 at 7:37 am

## Key Facts

**Titel:** A low APRI/ALBI score predicts a favourable outcome after liver resection for malignancies

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** T. Reese, J. Kammann, A. Pourian, J. Boecker, K. Oldhafer

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**Country:** Germany, Germany, Germany, Germany, Germany

## Introduction

The aspartate aminotransferase (AST) to platelet ratio index (APRI) / albumin–bilirubin (ALBI) score is supposed to predict posthepatectomy liver failure (PHLF) and mortality after liver resection. The aim of study was to validate a previously proposed cut-off value in a high-volume tertiary referral centre.

## Materials & Methods

In total 800 patients undergoing major (?3 segments) or minor (?2 segments) liver resection for CRLM, HCC, iCCA, pCCA or GBC were included during a study period from 05/2013 until 12/2021. Multivisceral resections or ante situm resections were excluded. The previous described APRI/ALBI cut-off value of -2.46 was used to categorize patients into a low and high APRI/ALBI score.

## Results

The median APRI/ALBI score overall is -2.28 (IQR -2.53 to -1.89), while 547 patients (68%) fall into the high and 253 patients (32%) into the low APRI/ALBI score group. Preoperative baseline parameters, except for age, are comparable between patients with a high or low APRI/ALBI score. After liver resection, patients with a high APRI/ALBI score experienced more major surgical complications (Clavien-Dindo Grade ?IIIb) compared to patients with a low APRI/ALBI score (16% vs. 8%,  $p < 0.001$ , Table 1). In addition, PHLF (grade B/C) is 5% in APRI/ALBI high compared to 1% in APRI/ALBI low patients ( $p = 0.002$ ). The 30-day mortality is 3% ( $n = 18$ ) for patients with a high APRI/ALBI score and no mortality was seen in the low APRI/ALBI score ( $p = 0.004$ ). Overall survival (OS) was lower for patients with a high APRI/ALBI score with a 5-year survival of 34% compared to 45% for patients with a low APRI/ALBI score (Figure 1,  $p = 0.016$ ). This effect is even more prominent after major hepatectomy with a PHLF rate (grade B/C) of 10% for a high APRI/ALBI score, compared to 3% for a low APRI/ALBI score ( $p = 0.103$ ) and with a 30-day mortality of 6% compared to 0%, respectively ( $p = 0.046$ ).

## Summary

Only one third of the patients have a low APRI/ALBI score, which indicates a favourable outcome regarding surgical complications, PHLF, mortality and OS. Two thirds of the population have a high APRI/ALBI score and experienced higher but acceptable rate of postoperative PHLF and mortality, which is in line with current the literature. The APRI/ALBI cut-off value of -2.46 stratifies patients' postoperative course in a precise manner and should be implemented to the surgical evaluation of the patient.

## Literature

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# Abstract Information

No.: E23-444 | submitted: October 23, 2023 at 9:27 am

## Key Facts

**Title:** Impact of laparoscopic liver resection for access to the waiting list of a single regional liver transplant center in southern Italy: entry and dropout flow's analysis

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Duilio Pagano, Sergio Li Petri, Salvatore Gruttadauria

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**Country:** Italy, Italy, Italy

## Introduction

Hepatocellular carcinoma (HCC) is the most common primary liver cancer, and both liver resection (LR) and liver transplantation (LT) are potentially curative options.

We aimed to explore the impacting role of minimally invasive approach on entry and drop-out flows waiting list of a single regional center for LT in southern Italy with a very low deceased donation rate.

## Materials & Methods

We retrospectively analyzed our experience performed during a 7-year period between January 2016 and February 2023 in patients treated for end-stage-liver-disease (ESLD) and/or with surgically unresectable early and intermediate stage HCC. Linear correlation was used to evaluate dependence between the number of laparoscopic LR (LLR) treatments for HCC on the following flows of enrollments on the waiting list during the study period: -Enrollments present at the beginning of the year. -Enrollments that took place during the year, the Intention-To-Treat (ITT, present at the beginning of the year+admissions during the year). -Registrations present at the end of the year, and waiting for transplants for transplanted patients.

## Results

There were 282 HCC patients treated with a first-line approach of LLR (n = 116) or open LRs (n = 166), with an incremental number of LLR per months. Considering the number of LLR and the rate of drop-out of ITT population and the number of enrolled patients per year, we observed a strong inverse linear correlation ( $\rho = -0.82, p = 0.023$ ). (Figure 1)

## Summary

Minimally invasive surgical therapies for HCC has a specific impact on drop-out percentage of overall ITT population, and waiting time for transplants for transplanted HCC patients.

## Literature

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# Abstract Information

No.: E23-458 | submitted: October 24, 2023 at 6:38 am

## Key Facts

**Titel:** Comparison of survival and recurrence in patients with HCC with and without LVI who underwent liver transplantation and the prognostic role of LVI

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Umut Tüysüz, ?mam Bak?r Bat?

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**Country:** Turkey, Turkey



## Introduction

The prognostic impact of intrahepatic lymphatic vessel invasion (LVI) in hepatocellular carcinoma (HCC) has rarely been reported. Tumor-associated lymphangiogenesis reportedly correlates with prognosis after HCC resection. Furthermore, a few reports showed correlations between LVI and LNM in HCC. Although several prognosticators, such as lymph node metastasis (LNM), microvascular invasion, tumor size and number, level of AFP were reported for HCC but the prognostic impact of intrahepatic LVI in HCC was not reported previously. We sought to clarify the prognostic impact of intrahepatic lymphatic system involvement in HCC.

## Materials & Methods

In the study, a total of 178 patients who underwent liver transplantation due to HCC in two centers between 2002 and 2020 were retrospectively analyzed. Based on the pathological examination, the patients were divided into two groups: those with lymphovascular invasion and those without. We aimed to examine the prognostic effect of LVI in HCC by comparing survival and recurrence in patients with HCC who underwent liver transplantation, with and without lymphovascular invasion.

## Results

The recurrence rate in the group with lymphovascular invasion was significantly higher than group without lymphovascular invasion. The mortality rate in the group with lymphovascular invasion was significantly higher than the group without. The predicted disease-free survival time and overall survival time in the group with lymphovascular invasion was significantly lower than in the group without invasion. In the univariate model, a significant effect of Age, Tumor Size (mm), Number Of HCC Lesions, Locoregional Treatment, Microvascular Invasion, lymphovascular invasion on disease-free survival time was observed. In the multivariate reduced model, a significant independent effect of Tumor Size (mm), Number Of HCC Lesions, and lymphocyte invasion on disease-free survival time was observed. In the univariate model, a significant effect of Tumor Size (mm), Number Of HCC Lesions, Locoregional Treatment, Microvascular Invasion, and lymphovascular invasion was observed on overall survival time. In the multivariate reduced model, a significant-independent effect of Tumor Size (mm) and lymphovascular invasion on overall survival time was observed.

## Summary

LVI have independent prognostic impacts for HCC, but the correlations with LNM remain unclear. In other words in recent study, to reveal the association between LVI/prognosis, thorough pathological evaluation of LVI. Nevertheless, if the prognostic role of intrahepatic lymphatic system and mechanism of lymphatic spread of HCC are fully investigated, the treatment strategy such as surgical procedure or perioperative chemotherapy will be better utilized.

## Literature

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# Abstract Information

No.: E23-465 | submitted: October 24, 2023 at 10:07 am

## Key Facts

**Titel:** Is resection of hepatic and pulmonary metastases in CRC beneficial?

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Christopher Berlin, Magdalena Menzel, Andreas Jud, Gabriel Stoeger, Stefan Fichtner-Feigl, Philipp A. Holzner

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**Country:** Germany, Germany, Germany, Germany, Germany, Germany

## **Introduction**

Colorectal cancer (CRC) represents a formidable global health challenge, ranking as the second and third most prevalent malignancy in women and men worldwide. Despite the efficacy of surgical resection and adjuvant systemic therapy in managing primary, non-metastatic local disease, the treatment of stage IV CRC presents a formidable medical endeavor. Challenges such as chemotherapy resistance, and/or the advent of multivisceral metastases frequently curtail the effectiveness of conventional therapeutic modalities. Moreover, the intrinsic heterogeneity of CRC mandates the development of personalized and tailored treatment approaches.

## **Materials & Methods**

In this retrospective analysis, we scrutinized the outcomes of 201 stage IV CRC patients exhibiting synchronous or metachronous hepatic and pulmonary metastases, focusing on the impact of surgical resection of metastatic lesions. All patients received treatment at the Comprehensive Cancer Center Freiburg (CCCF) and underwent surgical resection of the primary tumor. Of these, 100 patients underwent surgical resection of both liver and lung metastases, concomitant with systemic therapy, while 101 patients exclusively received systemic therapy. Intriguingly, our retrospective dataset revealed survival advantages in the surgically treated cohort, encompassing metachronous and synchronous diseases, right-sided and left-sided colon cancers, as well as rectal primary tumors. Encouragingly, patients harboring KRAS mutations similarly experienced favorable outcomes following surgical resection.

## **Results**

While the comprehensive evaluation of multimodal treatment strategies and the further stratification of patient subpopulations necessitate multicenter and prospective study designs, our investigation provides promising insights into the outcomes of CRC patients with multivisceral metastases.

## **Summary**

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## **Literature**

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# Abstract Information

No.: E23-471 | submitted: October 25, 2023 at 1:47 pm

## Key Facts

**Titel:** Influence of Perineural (Pn) Invasion on Survival of Resected Perihilar Cholangiocarcinoma

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Rabea Margies, Fabian Bartsch, Lisa-Katharina Gröger, Hauke Lang

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**Country:** Germany, Germany, Germany, Germany

## Introduction

Perihilar cholangiocarcinoma is a rare malignancy of the biliary tract which turns out to be very aggressive with a poor overall survival [1]. It is defined as a cholangiocarcinoma located at the extrahepatic biliary tree proximal to the origin of the cystic duct. Furthermore, classification is divided into five anatomic types using the modified Bismuth-Corlette classification (Figure 1) as a preoperative staging [2].

Surgical resection offers the only possibility of cure. The location and close proximity to important structures in the liver hilum such as liver artery and portal vein makes curative resection often technically difficult and extended resections with vascular reconstructions need to be performed [3]. There is controversy concerning excision to achieve a local R0 resection to completely remove all tumor tissue as there is a tendency of the tumor to grow into the perineural tissue and spread continuously along the bile duct wall [4, 5]. For this reason, we investigated the impact of perineural invasion (Pn) on overall survival in a group of resected perihilar cholangiocarcinoma from January 2014 to September 2023.

## Materials & Methods

We included data of all patients who underwent surgical exploration for perihilar cholangiocarcinoma Bismuth type I to IV between January 2014 to September 2023 in an institutional database. Preoperative staging of the carcinoma was either detected in MRI/MRCP, ERCP or PTCD. Surgical explorations and resections were performed by a team of experienced surgeons specialized in hepatobiliary surgery. Perineural invasion was analyzed in histopathological results of the specimen according to the 8th edition of the TNM classification. Statistical analyses were performed with SPSS 23 (SPSS Inc., released 2014, IBM SPSS Statistics for Windows, Version 23.0, IBM Armonk, NY, USA: IBM Corp). Overall survival analysis was performed with the Kaplan–Meier method. A p-value of < 0.05 was considered significant.

## Results

Within the survey period 178 patients underwent surgery of which 140 patients (78.7%) were resected either which right or left hemihepatectomy, extended right or left hemihepatectomy, mesohepatectomy, bisegmentectomy or resection of extrahepatic bile ducts. 38 patients (21.3%) underwent exploration, main reasons of termination were peritoneal carcinomatosis (n = 15), infiltration of hepatic artery or other structures of the liver hilum (n = 13) and other reasons for example too less remaining liver parenchyma or infiltration of the duodenum (n = 10). In preoperative imaging and diagnostics 15 of the resected patients were classified as Bismuth type I (10.7%). 13 patients (9.3%) Bismuth type II, 46 (32.9%) type IIIa or IIIb and 63 (45%) type IV. For three patients (2.1%) no classification could be ruled out. T-, N- and R-status as well as UICC classification are showed in Table 1. Perineural invasion has a high prevalence in patients with perihilar cholangiocarcinoma. Overall, 114 patients of 140 (81.4%) showed perineural invasion. As higher the Bismuth classification according to histopathological results gets as more patients show a perineural invasion (Table 2). In comparison of the overall survival of resected patients with and without perineural invasion there was a better survival of patients without perineural invasion (Figure 2). We performed an analysis that excluded (Figure 2A) and included (Figure 2B) perioperative mortality. In total there was no statistical significance ( $p = 0.365$  and  $p = 0.853$ ). We additionally performed an analysis which only showed overall survival of patients with Bismuth type IV perihilar cholangiocarcinoma (Figure 3). There was again no statistical significance between perihilar invasion and no perihilar invasion.

## Summary

### Discussion

Various previous studies showed a low overall survival in patients with perineural invasion of malignant tumors in general [6]. There also are studies that show a significant worse overall survival of patients with perineural invasion in intrahepatic cholangiocarcinoma [7]. In our case there was a limited number of patients, which may underpower the analysis to reach significant results, but as there was a high prevalence of patients with perineural invasion in perihilar cholangiocarcinoma it was associated with a poor overall survival.

Perineural invasion is a very interesting factor in spread and local expanse of perihilar cholangiocarcinoma as in comparison for example to lymphangiogenesis there is a continuous way of tumor growth. Especially interesting is the tumor expanse in the direction of the pancreas. So there are still remaining unsolved questions about radical approach to resect all tumor mass to achieve cure and get better survival rates.

### Conclusions

Perineural invasion has a high prevalence in perihilar cholangiocarcinoma and shows a worse overall survival.

## Literature

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# Abstract Information

No.: E23-478 | submitted: October 27, 2023 at 1:02 pm

## Key Facts

**Titel:** Combined resection of liver and biliary bifurcation for colorectal liver metastasis – A single center experience

**Topic:** Varia

**Format:** ePoster

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**Country:** Germany, Germany, Germany, Germany, Germany

## Introduction

Colorectal cancer is the third most common type of cancer in the world, with about 30% of patients suffering from colorectal liver metastases (CRLM). Surgical removal is the standard of care but centrally located metastases are challenging because of close proximity to important hilar structures. Infiltration of the central bile ducts by CRLM is a rarely described phenomenon, but these tumors can cause cholestasis by obstructing biliary outflow and thus mimic perihilar cholangiocarcinoma. The aim of this study was to investigate the outcome of patients with CRLM undergoing combined liver and extrahepatic bile duct resection and whether biliary infiltration had an impact on overall survival (OS) as well as recurrence free survival (RFS).

## Materials & Methods

Patients who underwent liver resection for CRLM at our institution were collected in a prospective liver resection database. Data collection was completed by December 2021 with a minimum follow-up of 24 months until August 2023. Patients were screened for a combined resection of the biliary bifurcation and divided into two groups regarding the infiltration of CRLM into the bile duct as confirmed by pathology reports. Analyzed data also included preoperative clinical findings, operative details and perioperative complications while OS and RFS were defined as the primary endpoints.

## Results

Between 2008 and 2021, a total of 1156 patients underwent surgery for the resection of CRLM at our institution. 18 patients underwent an additional resection of an extrahepatic bile duct with reconstruction of the biliary tract. In 5 of the 18 cases bile duct infiltration of CRLM could be proven. Regarding patient characteristics and surgical procedures there were no statistical differences. Complete resection of the metastases (R0) was achieved in 14 cases. Vascular R1 resection was accepted in three cases, parenchymal R1 resection occurred in one case. Postoperative complications requiring intervention were documented in 10 out of 18 cases, with biliary fistulas being the most common. There was no in-hospital mortality. Median RFS was 9.5 months (range 2-183 months) and median OS was 26.5 months (range 2-183 months) with no statistical differences between both groups.

## Summary

While occurrence of CRLM is common, infiltration into the central biliary tract is rare. We have shown that resection of these CRLM is feasible and comparatively safe. The perioperative approach should be closely related to treatment of perihilar cholangiocarcinoma, which the CRLM can mimic. In our study infiltration of the bile duct by CRLM did not have a significant effect on RFS or OS. This might be because of a relatively small number of patients, though our study is already one of the largest of its kind. Knowing that infiltration of the bile duct is a possibility, we hope to identify similar cases in the future to be able to consolidate our findings.

## Literature

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# Abstract Information

No.: E23-506 | submitted: October 27, 2023 at 1:22 pm



## Key Facts

**Title:** Rapid liver regeneration following PVE/HVE improves overall survival compared to PVE – A midterm analysis of the multicenter DRAGON 0 cohort

**Topic:** Varia

**Format:** ePoster

## Author(s)

**Name(s):** Remon Korenblik, Jan Heil, Jens Smits, Sinead James, Wolf Bechstein, Marc Bemelmans, Christoph Binkert, Stefan Breitenstein, Michael Williams, Olivier Detry, Maxime Dewulf, Alexandra Dili, Lukasz Filip Grochola, Jon Grote, Daniel Heise, Jennifer Kalil, Peter Metrakos, Ulf Neumann, Sam G. Pappas, Francesca Pennetta, Andreas Schnitzbauer, Jordan Tasse, Bjorn Winkens, Steven Olde Damink, Christiaan Van der Leij, Erik Schadde, Ronald Van Dam

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**Country:** Netherlands, Germany, Netherlands, Netherlands, Germany, Germany, Switzerland, Switzerland, United States, Belgium, Netherlands, Belgium, Switzerland, Germany, Germany, Canada, Canada, Netherlands, United States, Netherlands, Germany, United States, Netherlands, Netherlands, Netherlands, Switzerland, Netherlands

## Introduction

In patients with an estimated too small future liver remnant (FLR), portal vein embolization (PVE) is the gold standard to improve resectability by increasing the FLR to an appropriate size before resection to avoid post-hepatectomy liver failure. The recent DRAGON 0 study, however, demonstrated the superiority of the novel simultaneous portal and hepatic vein embolization (PVE/HVE) technic over PVE in terms of liver growth and resectability. This study provides the mid-term oncological outcome of the DRAGON 0 cohort.

## Materials & Methods

In this retrospective study, all DRAGON 0 centers provided follow-up data of all DRAGON 0-included PVE/HVE and PVE cases between 2016 and 2019. Primary and secondary liver tumors were included. Kaplan-Meier analysis was performed to assess 3-year overall and recurrence-free survival. Factors with a potential influence on survival were assessed by multivariate analysis using stepwise regression.

## Results

In total, 199 patients from 7 centers were included, of which 39 (20%) underwent PVE/HVE and 160 (80%) PVE. Median time to follow-up was 32 (PVE/HVE) and 17 months (PVE) ( $p=0.652$ ). PVE/HVE provided a significant better overall survival (PVE/HVE: not reached after 36 months vs. PVE: 20 months,  $p=0.004$ ), while there was no difference in progression-free survival (PVE/HVE: 19 months vs. PVE: 11 months,  $p=0.088$ ). Multivariable analysis demonstrated PVE/HVE to be an independent predictor of survival (odds ratio: 0.46 (confidence interval: 0.27 – 0.76),  $p=0.003$ ).

## Summary

Rapid liver regeneration by PVE/HVE appears to improve survival compared to PVE. Nevertheless, prospective randomized trials are warranted to further investigate, if PVE/HVE should be preferred over PVE.

## Literature

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# Abstract Information

No.: E23-512 | submitted: October 30, 2023 at 10:06 am

## Key Facts

**Titel:** Liver Trauma: In-vivo Detection of intraabdominal Free Fluid Detection Rates with Focussed Assesment with Sonography in Trauma (FAST) algorithm

**Topic:** Varia

**Format:** ePoster

## Author(s)

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**Country:** Germany, Germany, Germany, Germany, Germany

## Introduction

The liver is the most likely injured organ in abdominal trauma and can cause massive hemorrhage. An emergency sonography is common practice in the initial assessment of trauma patients. According to the German level 3 guideline on the treatment of patients with severe/multiple injuries, the standardized FAST protocol (focused assessment with sonography in trauma) is an integral part of the diagnosis of both seriously injured patients. According to the annual report of the DGU Trauma Registry 2021, a FAST examination is performed in 82% of patients in the primary survey. The pooled sensitivity and specificity of free fluid detection are 74% and 98%, respectively. Thus, it is a valuable tool, however the available data does not support FAST to be a reliable ruling out free fluid, as the diagnostic accuracy is largely dependent on the amount of free fluid. The aim of this work is to investigate for the first time in vivo at what quantity of intra-abdominal fluid the abdominal FAST becomes positive.

## Materials & Methods

This analysis was part of a project together with Fraunhofer IGD to provide 3D-ultrasound datasets to validate an automated free fluid detection algorithm. In the period from November 2020 to April 2023, 93 subjects were included in the study. The examination took up to 20 minutes plus preparation and post-processing in the operating theatre, it was only performed in 43 subjects, of whom evaluable images could be acquired in 35. We performed sequential fluid instillation and FAST as part of an elective laparoscopy. After umbilical laparoscopic access and exclusion of injuries in the access area as well as pronounced adhesions, sonographic blank images of Koller's, Morrison's and Douglas'/Proust's spaces (longitudinal and transverse) were performed. A cross-sectional image of each pouch was saved. This was followed by stepwise instillation of NaCl 0.9% until the defined fluid volumes (250, 500, 1000 and 1500 ml) were reached, with subsequent repeat sonographic examination of the intra-abdominal pouches. Inclusion criteria included subjects of legal age and available informed consent. Patients with previous abdominal surgery in the pouch regions were excluded.

## Results

The examination was performed using a General Electronics Voluson S8 T with a RAB6-RS 2-8 MHz ultrasound probe. The ultrasound examiners were surgical specialists with many years of experience in abdominal and emergency sonography. A positive ethical vote of the responsible ethics committee was available. Statistical analysis using SPSS version 1.6.2, frequencies and chi-square, significance level  $p=0.05$ .

A total of 20 images were acquired from each subject and a total of 700 images were available for analysis. The mean age was 45.8 (21-76) years, the mean BMI was 27.3 (19-40)  $\text{kg/m}^2$ . 48.6% were female. Intra-abdominal fluid before instillation of the first fluid portion was not found in any subject. The sensitivity of the overall examination for visualization of free abdominal fluid was 22.9% after instillation of 250 ml, 68.6% after 500 ml, 94.3% after 1000 ml and 100% after 1500 ml.

The detection rate varied significantly depending on the amount of fluid and the region examined. The Morrison pouch showed the highest detection rate here with a fluid volume of 1500ml with 77.1%. Due to the anatomical location and frequent air overlap through the lung, colon or stomach, the Koller pouch was still negative at 62.9% for 1500ml of intra-abdominal fluid. The Douglas'/Proust pouch examined longitudinally has a higher detection rate than the same pouch scanned transversely. Significant differences were observed by combining both planes. If one compares the Douglas'/Proust pouch scanned transversely with both planes, the detection rate changes from 8.6% to 17.1% for 250 ml, from 31.4% to 48.6% for 500 ml, from 51.4% to 77.1% for 1000 ml and from 68.6% to 91.4% for 1500 ml.

A significantly better detection rate was found for BMI  $<30\text{kg/m}^2$  ( $p=.037$ ). Gender or previous abdominal surgeries did not affect the detection rates.

## Summary

Surprisingly, even 1500 ml of fluid does not lead to a positive examination result in every scanned pouch should be kept in mind. Hence, whenever the FAST is positive in suspected abdominal and hepatic injury, a significant intraabdominal hemorrhage needs to be considered and guide further diagnostic and treatment approaches. The diagnostic accuracy is likely to be improved by scanning the pouches in two planes.

# Abstract Information

No.: E23-522 | submitted: October 30, 2023 at 10:16 am

## Key Facts

**Title:** From Liver to Trauma: Extracellular Vesicles Are a Promising Liquid Biopsy Tool

**Topic:** Varia

**Format:** ePoster

## Author(s)

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**Country:** Germany, Germany, Germany, Germany, Romania, Germany, Germany, Germany, Germany

## Introduction

One of the major problems faced by researchers and clinicians is the lack of reliable disease and trauma biomarkers, which would be suitable for screening, diagnosis, monitoring and prediction of treatment response. Liquid biopsy presents a pool of circulating molecules in the bloodstream and represents an appealing target. In this study, we summarize our recent findings highlighting the promising role of small extracellular vesicles (EVs) as novel potential biomarkers in hepatocellular carcinoma (HCC), cholangiocarcinoma (CCA), and liver trauma, emphasizing its clinical performance.

## Materials & Methods

Small EVs from 24 patients' sera with HCC or CCA were isolated by size exclusion chromatography. Particle counts were measured by nanoparticle tracking analysis. Small EVs – also named exosomes – were captured on a microarray chip coated with CD9, CD63 and CD81 and surface stained with fluorescent labelled anti-CD133/2 antibody. Surface analysis of small EVs on a single particle level was performed with ExoView® R100 (NanoView Biosciences, Boston, USA). Additionally, thrombocytes, ALP, CRP were assessed.

In 61 polytrauma patients' serum (ISS >15) concentrations of monocytes-derived small EVs were also isolated by commercially available SEC columns and counts were measured by NTA. They were captured with CD9, CD63 and CD81 on ExoView® chips and individual sEVs subpopulations were analyzed subsequently for expression of CD14, CD44, CD44v6 and CD61 with ExoView® R100.

## Results

Whole sera particle concentrations isolated from 24 patients with CCA and HCC differ significantly ( $p=0.0364$ ) with a mean particle concentration of  $1.8 \times 10^{15} \pm 1.4 \times 10^{15}$  ml in CCA and  $8.2 \times 10^{14} \pm 5.3 \times 10^{14}$  ml in HCC. Individual small EV subpopulations as characterized by CD9+CD133/2+ and CD81+CD133/2+ were significantly elevated in CCA (CD9+CD133/2+:  $p=0.0315$ , AUROC 0.74 and CD81+CD133/2+:  $p=0.0244$ , AUROC 0.826). Thrombocytes, ALP and CRP were elevated in CCA compared to HCC. ( $p=0.0238$  and AUROC 0.76;  $p=0.0023$  and AUROC 0.85;  $p=0.0092$  and AUROC 0.88, respectively). In 61 polytrauma patients with ISS >15 CD14, CD44, CD44v6 and CD61 were detectable on monocytes and predominantly on macrophages. Two cohorts were formed: patients with internal organ damage (OD) and patients without internal damage (w/o OD). Median CD9+CD14+sEVs and CD9+CD61+sEVs values measured 24 hrs post trauma were superior in identifying internal organ damage like liver or spleen laceration in polytrauma associated with a calculated cut-off of  $3.7 \times 10^5$  in CD9+CD14+sEVs per mL serum (AUROC: 0.97, sensitivity: 100% and specificity: 87%), followed by CD9+CD61+sEVs (cut-off:  $11 \times 10^7$ , AUROC: 0.85, sensitivity: 80% and specificity: 83%). Median CD9+CD14+ small EVs and CD9+CD61+ small EVs significantly correlated with ISS ( $p < 0.001$ ).

## Summary

We conclude that sEV profiling represents a minimally invasive and accurate liquid biopsy-screening tool that could improve diagnostics of patients with hepatobiliary malignancies. Our preliminary data support our hypothesis that the liquid biopsy via sEVs might also early determine and distinguish between polytrauma patients with internal organ damage like rupture or laceration of parenchyma organs vs. trauma patients with e. g. bone fractures alone.

## Literature