What's new in Interventional EUS?

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UC Irvine Health

Interventional EUS

- Tissue acquisition
  - Liver Biopsy
- Injection
  - Neurolysis
  - Anti-tumor agents
- Access/Drainage
  - Pseudocyst
  - Biliary/pancreatic ducts
  - Gallbladder
  - Gastro-enterostomy
- Ablation
  - PDT
  - Laser
  - RFA
  - Cryotherapy
- Vascular
  - Varices
  - Portal Vein Sampling
  - Portal Vein Pressure
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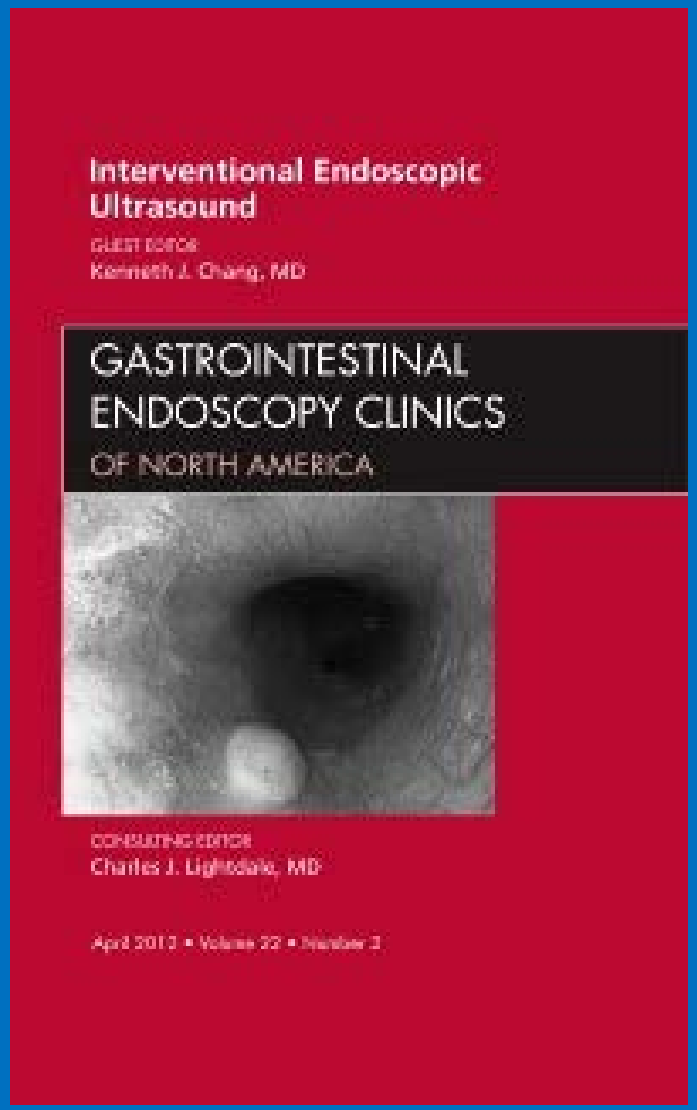


Preface

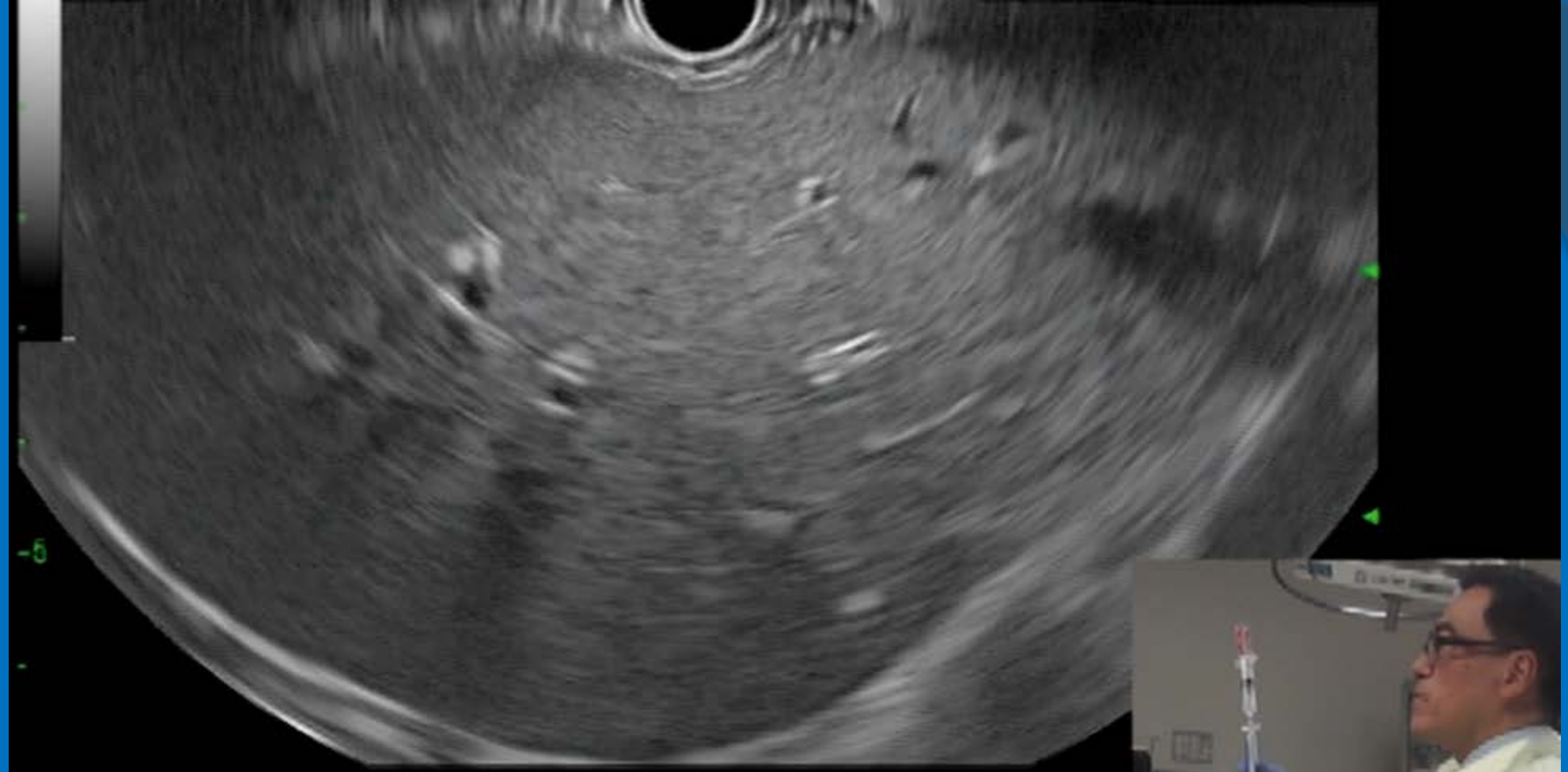
Interventional Endoscopic Ultrasound

Kenneth J. Chang, MD
Guest Editor

Endo-Hepatology: A New Paradigm

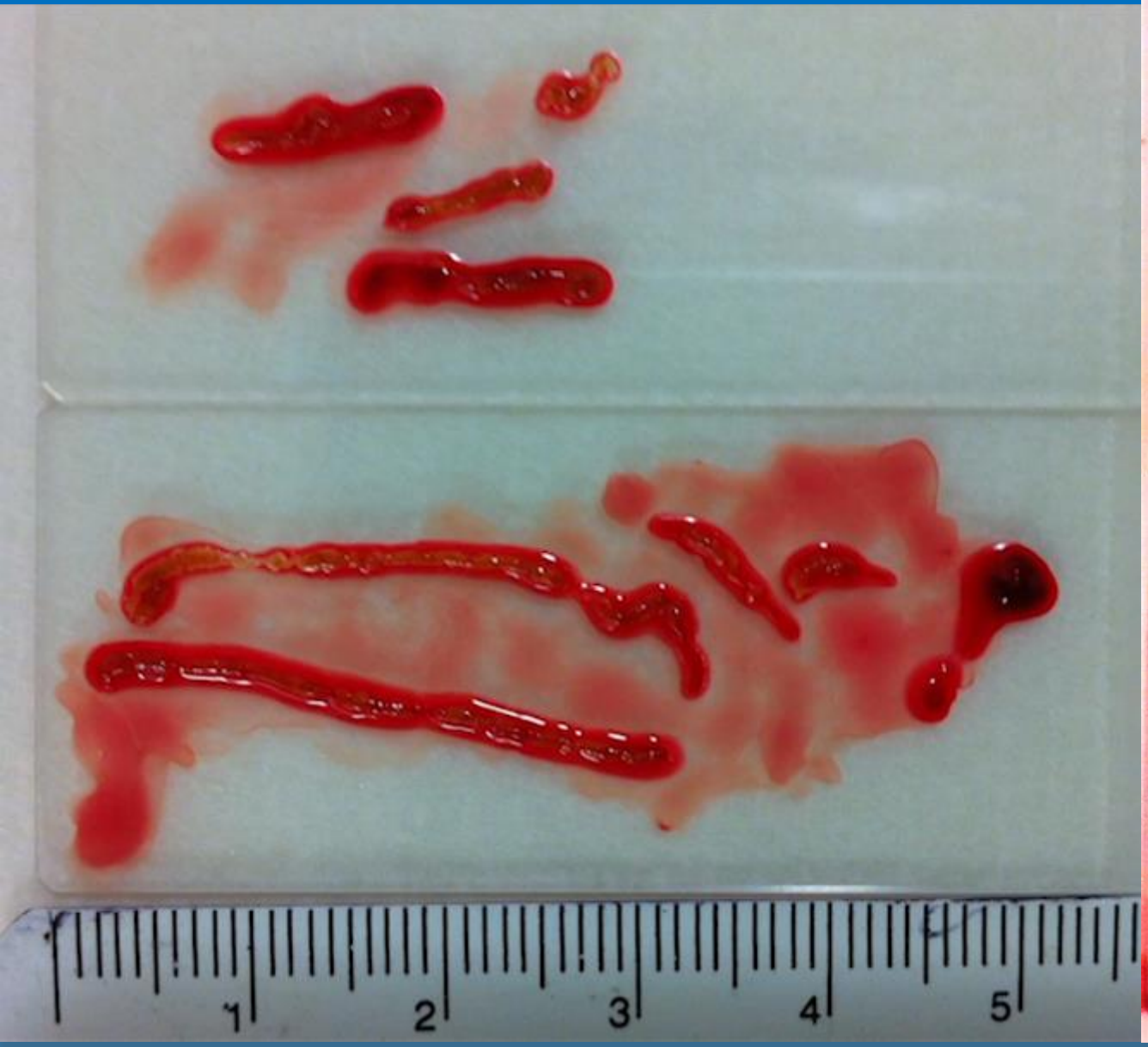
Kenneth J. Chang, MD[a,*], Jason B. Samarasena, MD[a], Takuji Iwashita, MD, PhD[b,c], Yosuke Nakai, MD, PhD[a,d], John G. Lee, MD[a]

EUS “Palpation” of Liver

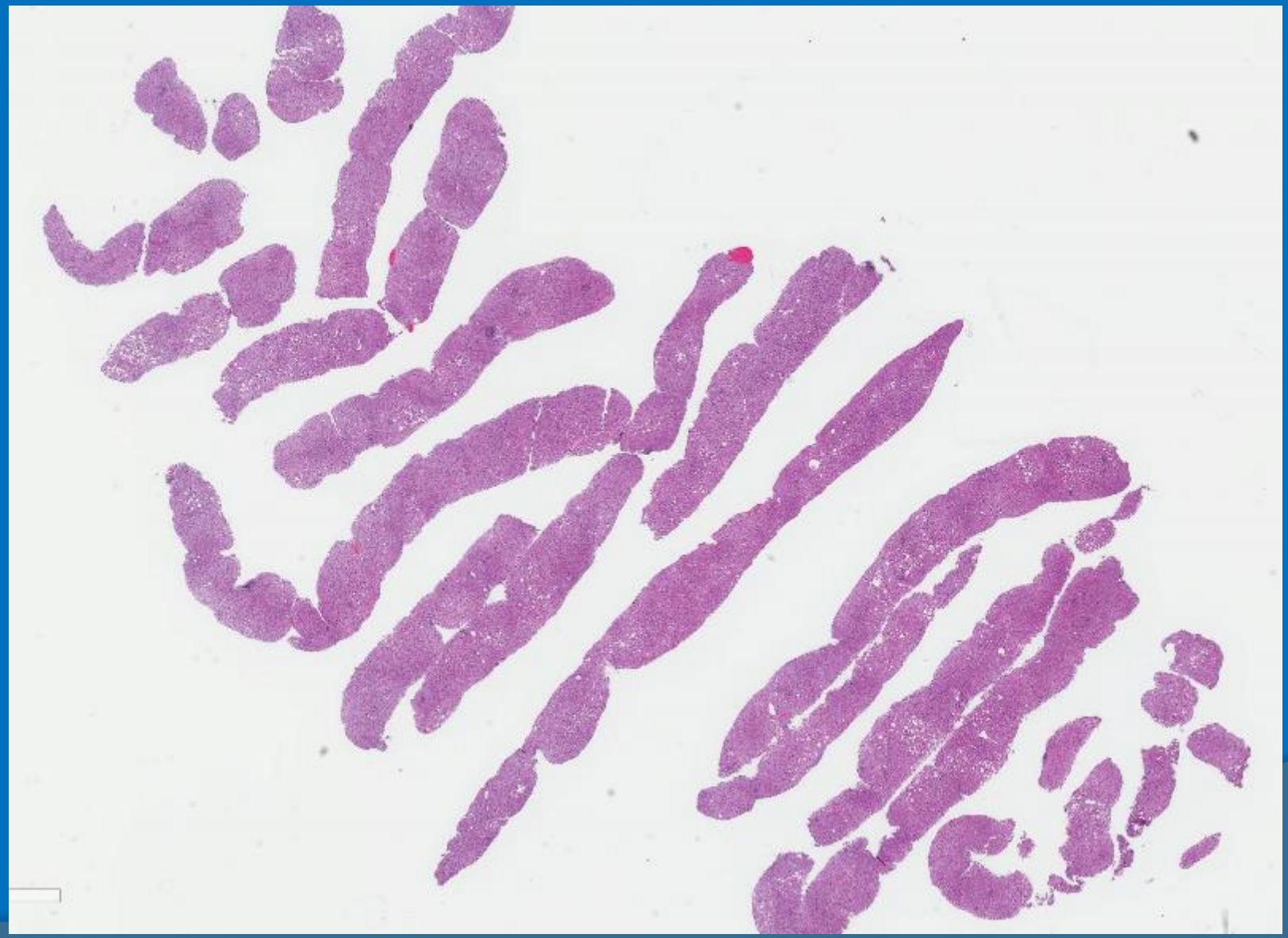


Liver Biopsy – 19G
Single pass, Hep/saline

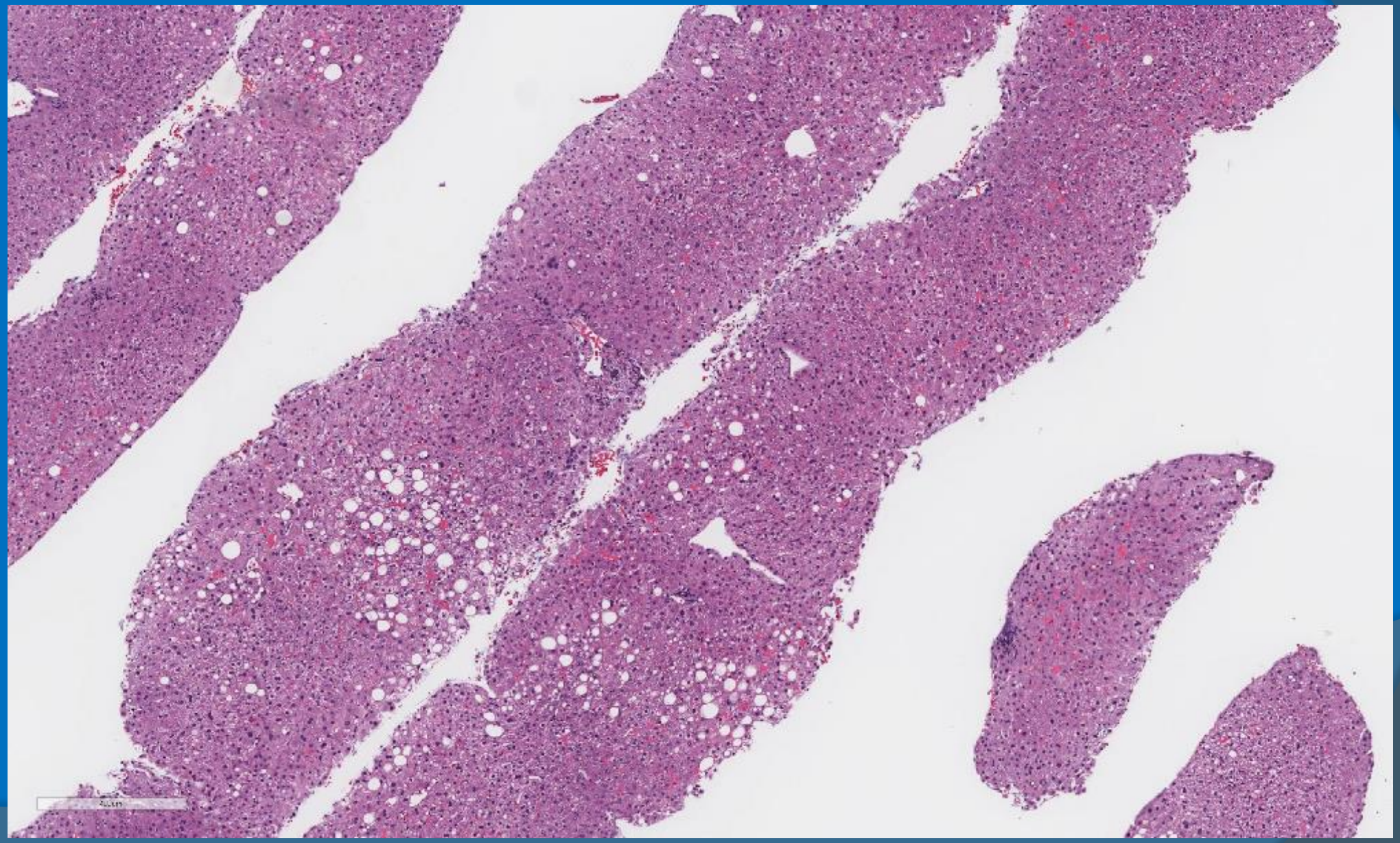
Multiple To-Fro, Fanning



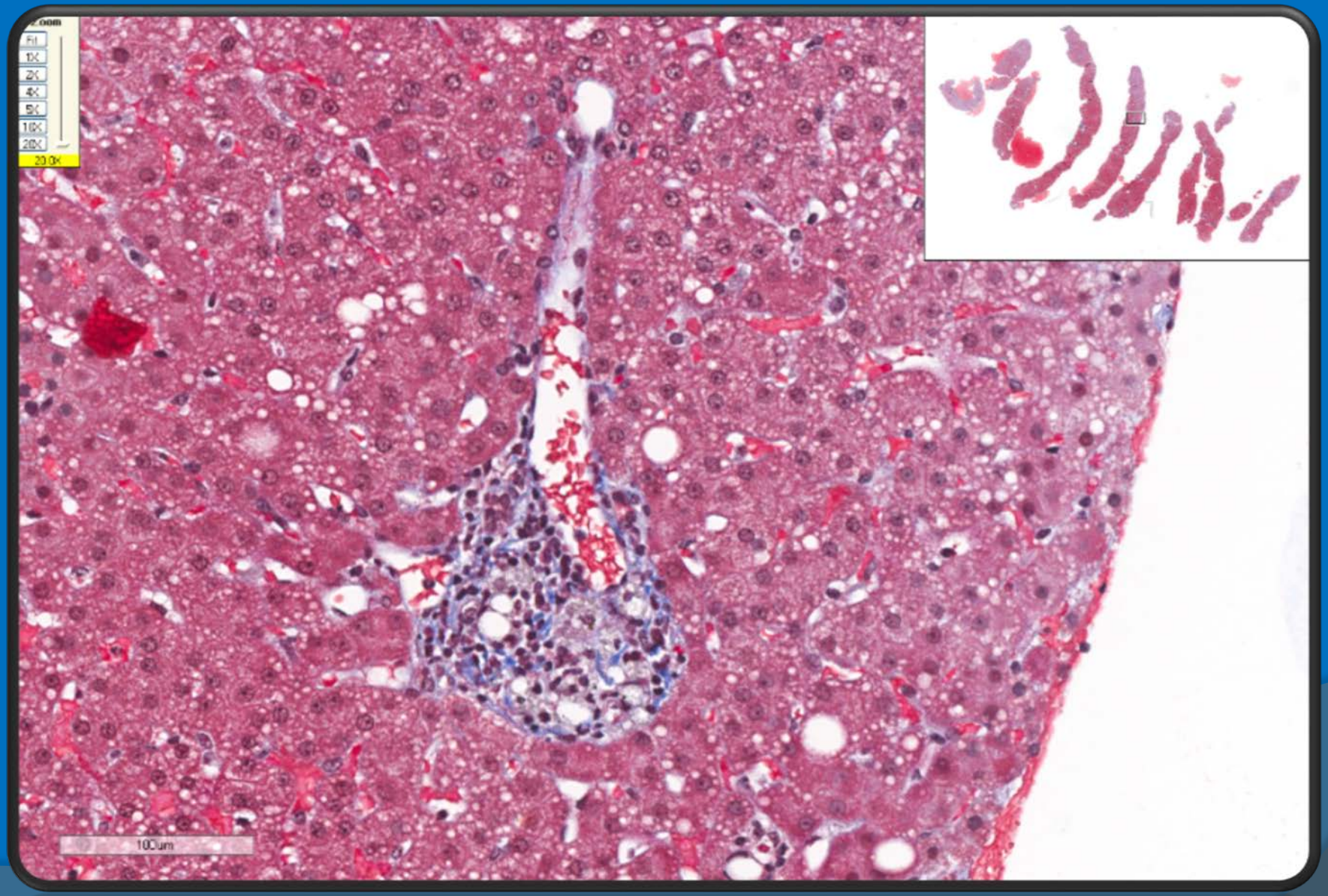
19G



19G

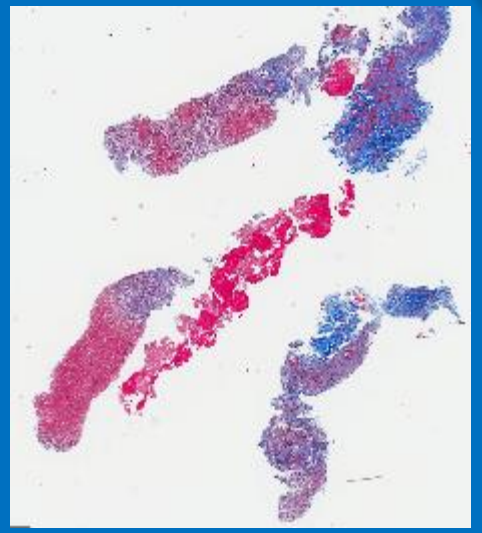


19G



19G

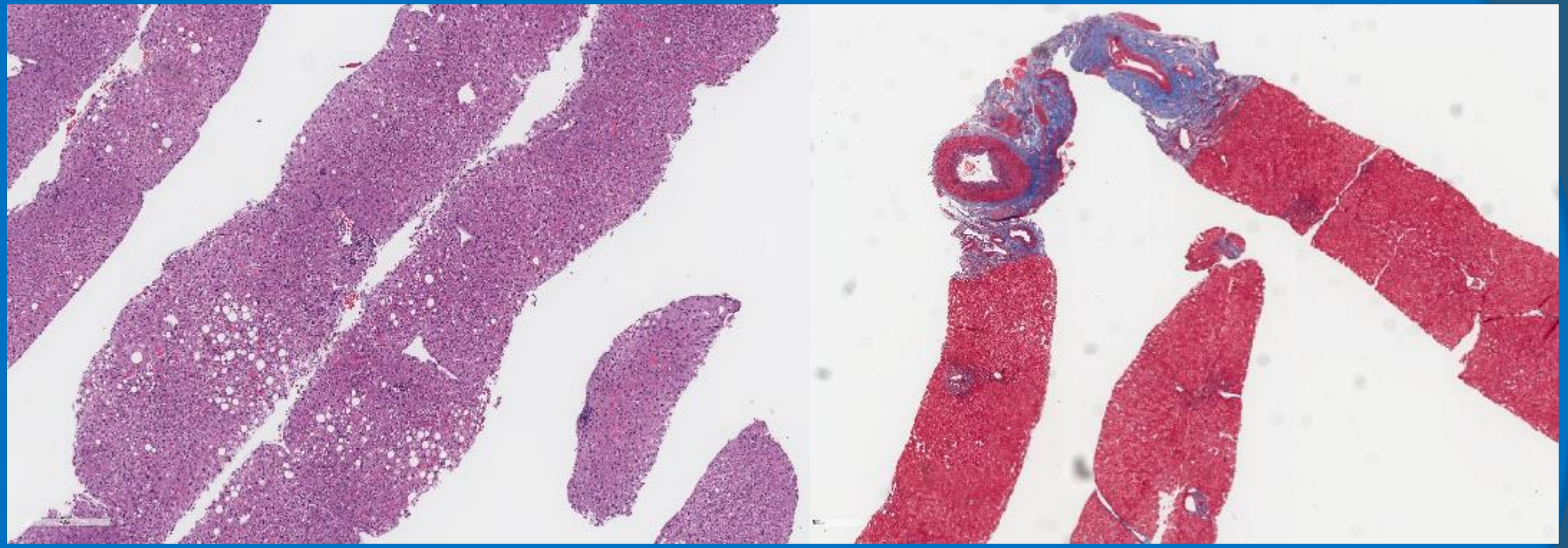
Trans-jugular



19G

Percutaneous

19G Percutaneous



DDW Abs #Su1388

Take Home:

- EUS-guided liver biopsy is superior to conventional percutaneous and transjugular biopsies

IS EUS GUIDED LIVER BIOPSY READY FOR PRIME TIME? YES

Presentation Number: Su1388

Mubeen Khan Mohammed Abdul[1], Mahmoud Bayoumi[1], Bilal Ali[1], Mohamad Imam[1], Shilpa Lingala[1], Faisal Kamal[1], Uzair Ashraf[1], Mohammad K. Ismail[1], Satheesh Nair[1], Sanjaya Kumar Satapathy[1]
[1]University Of Tennessee, Memphis, Tennessee, United States;

Background
Conventionally, liver biopsies have been performed via percutaneous and transjugular routes. Recently, endoscopic ultrasound (EUS) has been utilized to obtain core liver biopsies with varying success. One of the advantages of EUS-guided liver biopsy sampling (EUS-LB) is the ability to quickly and safely obtain liver passes from both lobes, thus minimize sampling error. Few studies have compared these methods of liver biopsies and have reached conflicting conclusions. We conducted a systematic review and meta-analysis to compare efficacy of EUS guided liver biopsies with both percutaneous and transjugular liver biopsies.

Methods
We searched Medline, Embase, Scopus and Web of Science databases from January 2008 through November 11, 2017 to identify studies comparing EUS guided liver biopsy yield with percutaneous or transjugular methods. We also searched abstracts of Digestive Disease Week from 2008 to 2017 to increase our search yield. Main out of interest was mean number of complete portal triads. Mean differences (MD) between the three modalities were calculated and pooled using fixed effect model. Quality assessment was conducted using Newcastle Ottawa Scale (NOS).

Results
We included a total of 4 observational studies with 347 patients in this systematic review and meta-analysis. Among them, 184 underwent EUS guided biopsy, 104 got percutaneous and remaining 59 underwent transjugular biopsy. One study was rated as high quality while remaining 3 studies were rated as moderate quality as per NOS assessment. All transjugular biopsies were performed with 21 G needle, percutaneous biopsies were performed with 18 G needles, while EUS guided biopsies could be performed with Shark Core needle 19G, FNA needle 19G or Procore needle 19G. Mean number of passes required by EUS was 2.6±1.1. Pooled MD with 95% confidence interval (CI) while comparing EUS with percutaneous biopsy was -1.65 (-3.03, -0.26), I^2=0% in favor of EUS. Pooled MD while comparing EUS with transjugular biopsy was -4.05 (-7.82, -0.27) in favor of EUS with no heterogeneity. There was no bleeding reported in any of the 184 patients who underwent EUS guided liver biopsies.

Conclusions
EUS guided liver biopsy is superior to the conventional percutaneous and transjugular biopsies and may become the diagnostic method of choice when biopsy is required. No adverse events related to bleeding or pain were reported in the EUS group.

DDW Abs #Su1372

Take Home:

- EUS-guided Liver Biopsy is more cost effective than percutaneous liver biopsy in patients with NAFLD

EUS GUIDED LIVER BIOPSY IS MORE COST-EFFECTIVE THAN PERCUTANEOUS LIVER BIOPSY IN PATIENTS WITH NON-ALCOHOLIC FATTY LIVER DISEASE(NAFLD)

Presentation Number: Su1372

Shruti Mony[1], Ishani Shah[2], Neil Vyas[1], Ajiaz Sofi[3], Ananya Das[3]
[1]Gastroenterology, St.Josephs Hospital and Medical Center, Phoenix , Arizona, United States; [2]Internal Medicine, St.Josephs Hospital and Medical Center, Phoenix, Arizona, United States; [3]Gastroenterology, Arizona Center for Digestive Health, Gilbert, Arizona, United States;

Introduction:
Recent studies have showed that EUS- guided liver biopsy(EUS-LB) using FNB needle is feasible, safe and has several advantages over percutaneous liver biopsy(PC-LB) including improved tissue acquisition (more specimen length and complete portal tracts). It is not only safer and but also targets areas and focal lesions in both lobes, may substitute ultrasound based screening for HCC and simultaneously provide a superior method for initial screening of portal hypertension and esophageal varices. However, to be clinically viable in Hepatology practice, such an approach needs to be cost-effective. The aim of our study was to evaluate cost-effectiveness of EUS guided liver biopsy compared to percutaneous liver biopsy using a systemic review of published information.
Methods:
Incremental cost-effectiveness ratio (ICER) of two primary strategies of EUS-LB vs. PC-LB were examined in a Markov model simulating the natural history of NAFLD in a hypothetical cohort 50 year old patients with NAFLD in whom a liver biopsy was indicated for clinical management over a time horizon of 5 years, and with a societal perspective. PC-LB procedures were performed under conscious sedation with ultrasound guidance and EUS procedures were performed with MAC in a hospital based outpatient setting. Under both strategies, repeat PC-LB was performed in case of initial biopsy being inadequate for pathological assessment; under the EUS guided strategy no additional cost of initial HCC screening by ultrasound and endoscopic screening for portal hypertension was considered in patients with advanced fibrosis and cirrhosis of liver. Clinical probabilities in terms of natural history of NAFLD, safety and diagnostic yield, adverse events with liver biopsy by both techniques and also health state utilities under both strategies were obtained from a systemic review of published information (Table). Only direct costs were considered and were obtained from Center for Medicare Services data and also from the National Inpatient Sample database.
Results:
In the baseline analysis, EUS based strategy dominated PC-LB with cost per patient of $2,610 vs. $ 2,660 and yielded 3.8741 QALY vs. 3.8738 quality adjusted life years (QALYs), respectively. Sensitivity analyses showed that the model is sensitive to parameters such as, cost of EUS-LB and PC-LB, probability of inadequate specimen by EUS –LB and probability of cirrhosis in the NAFLD cohort but still cost-effective within the range reported in published information (Figure1).
Conclusion:
EUS-LB is more cost-effective than PC-LB in patients with NAFLD and prospective randomized trials are needed to establish its superiority in clinical practice over percutaneous approach, considering that it obviates the need for initial endoscopic screening for esophageal varices in patients with cirrhosis.

DDW Abs #Su1413

Take Home:

- Best technique = heparin primed needle with high suction (15cc)
- (CPT 14.5) with heparin hi-suction vs (CPT 8.2) with dry needle low-suction

EUS GUIDED LIVER BIOPSY IN BENIGN LIVER DISEASE USING HEPARINIZED NEEDLE TECHNIQUE (HNT)

Presentation Number: Su1413

Toshitaka Shimizu[1], Kyle J. Fortinsky[1], Takeshi Tsujino[1], Yuxin Lu[1], Matt Alan Chin[1], Jason B. Samarasena[1], Kenneth J. Chang[1]

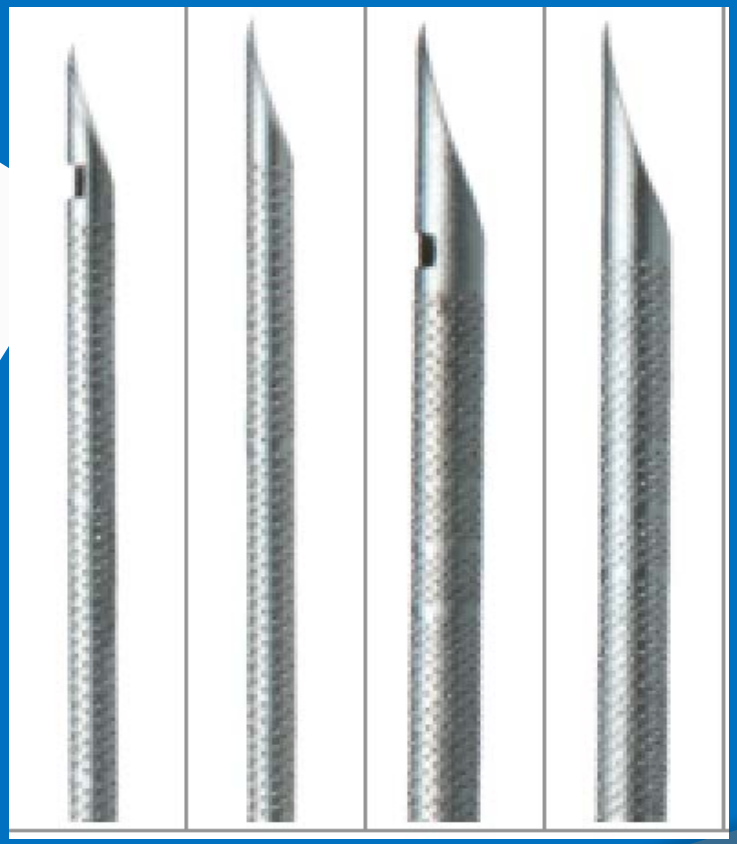
[1]Gastroenterology and Hepatology, University of California, Irvine, Orange, California, United States;

Background: Endoscopic ultrasound-guided (EUS) liver biopsy (LB) appears to be a safe and effective technique for the diagnosis of acute and chronic liver diseases. Achieving at least 11 complete portal tracts as is recommended by the AASLD is however not always attainable with current equipment and technique. Although a number of studies have evaluated different needle sizes and designs, few studies have addressed suction technique with EUS guided liver biopsy. Recently our team switched to a new heparinized needle technique (HNT) for EUS-LB.
Aims: To evaluate the efficacy of EUS-LB using a 19G straight FNA using HNT technique to aid in the diagnosis of acute and chronic liver disease.
Methods: We prospectively evaluated all patients undergoing EUS-LB at a single center by two experienced endoscopists (JS, KC). Prior to April 2016, the technique for LB included slow pull or 5cc dry suction. Due to the inferiority of some liver biopsy specimens, after April 2016 the HNT technique was employed. This technique involved a single pass with non-fanning using a 19-gauge straight FNA needle primed with 1000U/ml heparin and 15cc wet suction. All specimens were sent to expert GI pathologists for evaluation. Patients were discharged home the same day of the procedure and follow up phone calls were made.
Results: Forty-four consecutive patients were enrolled in the study with 31 patients being performed before April 2016 (pre-HNT) and 13 patients undergoing HNT after April 2016. The mean age was 57 years (range 19-80) and 57% were male. The indication for liver biopsy is displayed in Table 1. The mean number of CPT was 8.19(range 0-30) for patients pre-HNT and 14.5 (range, 4-30) for patients with HNT. The percentage of patients with a CPT> 11 was 29.9% for patients pre-HNT as compared to 61.5% for patients using HNT. Sixteen patients (36%) were staged as cirrhosis. All samples were adequate in achieving a histologic diagnosis from our pathologists. There were no adverse events.
Conclusions: In this study, EUS guided liver biopsy in benign liver disease using heparinized needle technique appears to be safe with superiority over standard suction techniques.

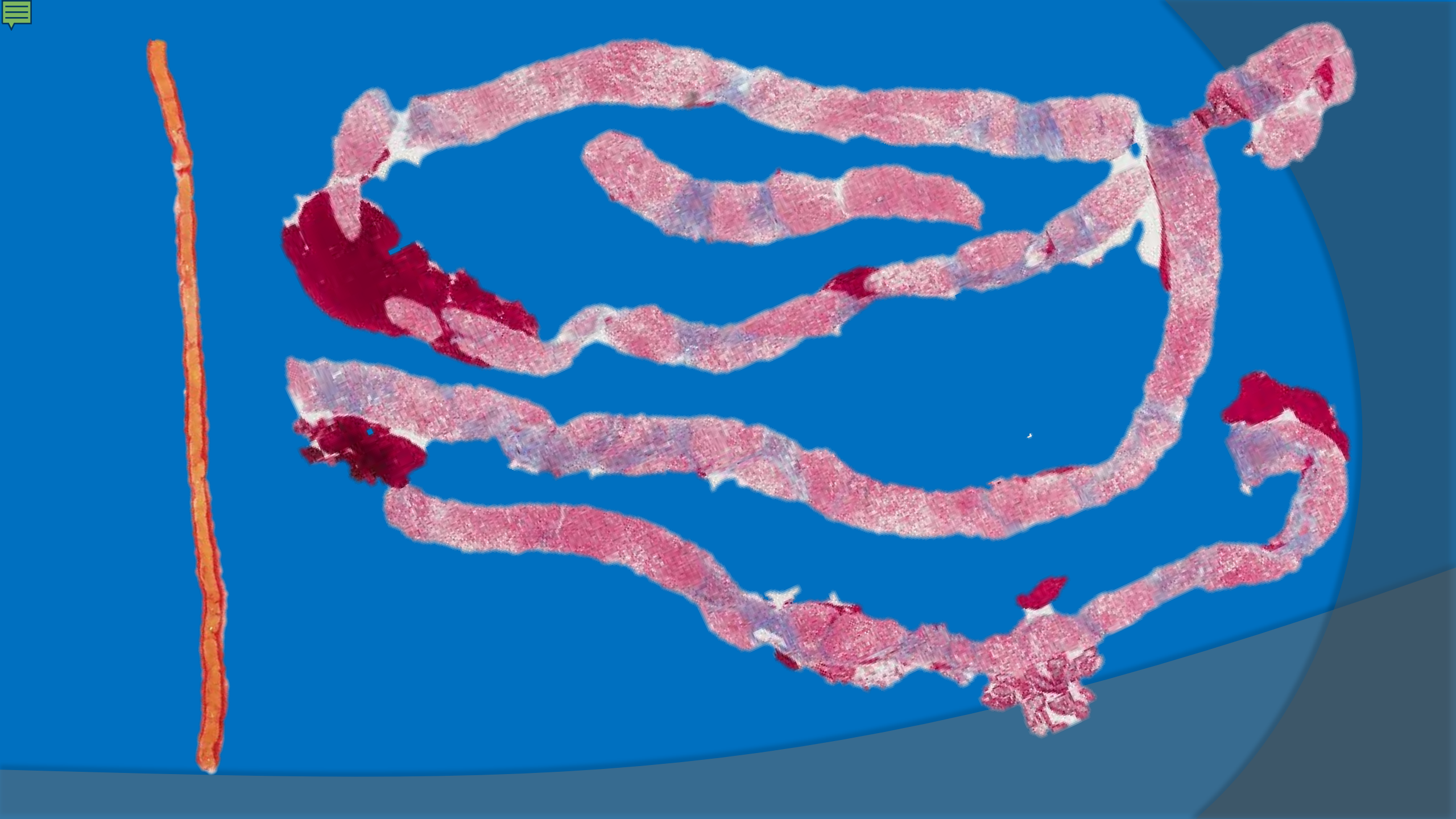
Specialized Tip Core needles

Fork-tip

Franseen



Menghini



Very long cores.....

DDW Abs #Mo1349

Take Home:

- 19G Franseen needle (61 CPT*) appears better than 19G standard tip needle (28 CPT*)

* Portal “structures”

A PROSPECTIVE RANDOMIZED TRIAL OF 19-GAUGE (G) ASPIRATION NEEDLE VERSUS 19G CORE BIOPSY NEEDLE FOR ENDOSCOPIC ULTRASOUND-GUIDED LIVER BIOPSY

Presentation Number: Mo1349

Rafael Antonio Ching Companioni[1], *Amitpal Singh Johal*[1], *Bradley Confer*[1], *Harshit S. Khara*[1], *David L. Diehl*[1]
[1]Gastroenterology and Nutrition, Geisinger Medical Center, Danville, Pennsylvania, United States;

INTRODUCTION: Percutaneous, transjugular and surgical approaches to liver biopsy are widely used. In recent years, several studies have demonstrated endoscopic ultrasound-guided liver biopsy (EUS-LB) to be a safe and effective method for accomplishing parenchymal liver biopsy. Normally, a 19G EUS aspiration (FNA) needle is used for biopsy, but different EUS needles have been tried for this purpose, producing variable results. There is emerging data suggesting that newer core needle technologies may improve tissue yields. However, there has not been a head-to-head comparison of 19G FNA versus a 19G core biopsy needle (FNB) for EUS-LB. **METHODS:** This was a prospective randomized trial comparing the biopsy specimen adequacy of a 19G EUS-FNA needle (Expect Flexible 19G, Boston Scientific, Marlborough, MA) vs a 19G FNB needle (Acquire 19G, Boston Scientific). Computer-generated randomization determined needle-type selection for 20 patients referred for EUS-LB. One transgastric pass and one transduodenal pass were performed in each patient, with heparin priming of the needle, full suction, and 7 to 10 to-and-fro movements of the needle with fanning. The specimen length and degree of fragmentation was determined before and after histological tissue processing, using computer-assisted image analysis. The number of portal structures per specimen was also evaluated. Statistical analyses were performed using SPSS version 21. One-way analysis of variance (ANOVA) and Tukey correction were used for statistical analysis, $P < 0.05$ considered to be significant. **RESULTS:** Twenty patients underwent EUS-LB, randomized to FNA or FNB needle. The median age was 50 years (range: 27-69), 10 patients (50%) were male. Both groups had similar demographic data and indications for EUS-LB. Biopsies were adequate for pathological interpretation in all cases. Demographic data for the two groups are shown in table 1. Compared to the FNA needle, biopsies with the FNB needle yielded longer intact tissue cores (mean 1.44 cm with the FNA vs 2.29 cm with FNB, $P = 0.0003$). In addition, the FNB needle produced longer aggregate specimen length (mean 16.31 cm vs 11.82 cm; P=0.056), more portal structures (mean 61 vs 28; P=0.001), and fewer fragments (mean 37.6 vs 64.9; P= 0.038) with more cores ≥9mm (Table 2). A single patient had abdominal pain after the liver biopsy with the FNB needle. **CONCLUSION**: EUS-LB using a novel 19G FNB needle delivers longer and less fragmented biopsy specimens than a 19G FNA needle. In addition, the number of portal structures in the specimen is also higher and there is less post-processing specimen fragmentation. These results indicate that a 19G FNB needle is better than a 19G FNA needle for EUS-LB.

DDW Abs #Su1425

Take Home:

- 19G Franseen needle (22.4 CPT) appears better than 19G fork tip needle (19.5 CPT)

A MULTI-CENTER RETROSPECTIVE STUDY OF 336 EUS-GUIDED FINE NEEDLE CORE LIVER BIOPSY WITH A MODIFIED 1-PASS 1-ACTUATION WET SUCTION TECHNIQUE COMPARING TWO TYPES OF EUS CORE NEEDLES

Presentation Number: Su1419

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[1] Borland Groover Clinic, JACKSONVILLE, Florida, United States;[2]Gastroenterology, East Georgia Gastroenterology, Statesboro, Georgia, United States; [3]Pathology, Baptist Medical Center, Jacksonville, Jacksonville, Florida, United States;

BACKGROUND AND AIMS: Endoscopic Ultrasound guided (EUS) Fine Needle Core Biopsy (FNCB) has proven to be safe and effective technique for diagnosis and staging of liver parenchymal disease. We evaluated the diagnostic yield, specimen adequacy in EUS-guided parenchymal biopsies and documented adverse events. We compared two types of EUS 19 G core needles. **METHODS**: This is a multi-center, retrospective study of 336 patients with unexplained abnormal liver function tests who were referred for EUS evaluation of elevated liver enzymes to evaluate for biliary obstruction and pancreatic pathology. EUS-guided liver biopsy (EUS-LB) was performed at the same session after biliary obstruction was excluded. We compared EUS-LB in 210 patients using a Franseen needle to 126 patients using a Fork-tip needle, using a modified 1-pass 1-actuation wet suction technique in patients referred for abnormal liver function tests. We compared intact specimen length (ISL), total specimen length (TSL), complete portal triads (CPT) and adverse events. (AE) **RESULTS:** 336 consecutive patients underwent EUS-LB and data were retrospectively evaluated. Median patient age was 52 yrs (range 7-84) and 138(41%) were male. The fork tip needle had an average **ISL of 2.7** cm, **TSL of 6 cm**, and median of **19.5 CPT** (range 7-73). Abdominal pain occurred in 50 patients (24%) immediately post-procedure, which resolved in all patients after intravenous administration of a low-dose narcotic. Subcapsular hematomas occurred in 2(0.9%) patients. The Franseen needle had an average **ISL of 3.1 cm, TSL of 6.9 cm**, and median of **22.4 CPT** (range 8-57). Abdominal pain occurred in 27 patients (21%) immediately post-procedure, which resolved in all patients after intravenous administration of a low-dose narcotic. Subcapsular hematoma occurred in 1(0.8%) and bile leak in 1(0.8%) patients. **CONCLUSION:** This is the first multi-center comparative study of 2 19G second generation EUS needles of different designs, in patient undergoing EUS-LB. The average CPT, ISL, TSL were significantly higher in the Franseen needle compared to fork-tip needle. Both needles using a modified 1-pass 1-actuation wet suction technique met 100% AASLD specimen adequacy (>11 CPT or TSL >2.5cm). AE were comparable between both needles.

DDW Abs #399

Take Home:

- 22 Gauge FNB needle appears adequate with (17 CPT's)

ENDOSCOPIC ULTRASOUND GUIDED LIVER BIOPSY USING A 22 GUAGE FINE NEEDLE BIOPSY NEEDLE: A PROSPECTIVE STUDY.

Presentation Number: 399

Muhammad K. Hasan[1], Evgeny A. Idrisov[1], Kambiz Shapoor Kadkhodayan[1], Ehsan Rafiq[1], Udayakumar Navaneethan[1], Ji Young Bang[1], Robert H. Hawes[1], Shyam vardarajulu[1]

[1]Center For Interventional Endoscopy, Florida Hospital, Orlando, Florida, United States;

BACKGROUND AND AIMS

Endoscopic ultrasound guided liver biopsy (EUS-LB), is gaining traction as a safe and effective alternative to percutaneous and trans-jugular liver biopsy. EUS guided true-cut and 19-gauge needles can be technically difficult to maneuver, particularly when sampling the right lobe. Other factors that have curtailed the wide spread use of EUS guided liver biopsy are, fear and anxiety about the potential complications with the use of larger bore needles and tissue fragmentation of the histological specimen. We prospectively aimed at evaluating the diagnostic adequacy and safety of EUS-LB using a smaller (22-gauge) fine needle biopsy (FNB) needle while using proper technique of tissue expression from the needle to prevent fragmentation of the specimen.

PATIENTS AND METHODS

Patients referred for endosonographic evaluation of elevated liver enzymes, in whom no obstructive etiology was identified on EUS and did not require ERCP, were included in this prospective, non-randomized study at a single tertiary hospital. EUS-LB was performed using a 22-guage EUS-FNB needle. A total of three passes were made from both lobes. With each pass, 3-4 back and forth slow movements were made in a fanning fashion without the use of suction. The needle was kept straight while disengaging from the scope and during tissue expression. Tissue was slowly expressed from the needle over 3-4 minutes using only the stylet. This technique was used to prevent tissue fragmentation. The presence of visible core tissue from each pass was evaluated, formalin-fixed and sent for histopathological evaluation in separate containers. Core length (CL) from each pass was measured and complete portal triads (CPT's) counted by a pathologist. Patients were followed for post procedure (2-4 hours), early (24 hours) and late (30 days) complications.

Results

17 patients (median age, 57 years; 10 women) underwent EUS-LB. Adequate core tissue for histopathological evaluation was obtained in all 17 patients (100%) without the use of suction. 16 patients (94%) required the use of a single 22-gauge FNB needle. One patient required an additional similar needle due to needle dysfunction. 1 sample (5.8%) was described as bloody, but contained adequate core tissue. The overall tissue yield per pass was a median CL (longest fragment per pass) of 5 mm (range 2mm-33mm) and median CPT of 17 (range 8-65). Tissue procurement from right liver lobe was described as technically easier by the endosonographers. The most common minor complication was mild abdominal pain in 3 patients (17.6 %) at 24 hours. There were no major complications, and no immediate or delayed bleeding.

Conclusion

EUS-LB using a 22-gauge FNB needle is safe and has an adequate diagnostic yield. Using proper technique for tissue procurement and expression from the needle can prevent tissue fragmentation.

DDW Abs #Su1426

Take Home:

- 22 Gauge FNB fork-tip needle appears adequate with (25 CPT's)

EUS-GUIDED CORE LIVER BIOPSY USING A 22G FORK-TIP NEEDLE WITH STANDARD SUCTION TECHNIQUE OFFERS A SAFE AND RELIABLE CORE LIVER TISSUE ACQUISITION: A PROSPECTIVE BLINDED TRIAL IN NONALCOHOLIC FATTY LIVER DISEASE

Presentation Number: Su1426

Fateh Bazerbachi[1], Eric J. Vargas[1], Taofic Mounajjed[2], Monika Rizk[1], Sudhakar Kundapur Venkatesh[3], Kymberly D. Watt[1], Naveen Gara[4], Ibrahim Hanouneh[5], Prasad G. Iyer[1], Michael J. Levy[1], Mark Topazian[1], Kenneth K. Wang[1], Barham K. Abu Dayyeh[1]

[1]Gastroenterology, Mayo Clinic, Rochester, Minnesota, United States; [2]Pathology, Mayo Clinic, Rochester, Minnesota, United States;[3]Radiology, Mayo Clinic, Rochester , Minnesota, United States;[4]Gastroenterology , University of California, San Diego, San Diego, Minnesota, United States;[5]Minnesota Gastroenterology, Minneapolis, Minnesota, United States;

INTRODUCTION The yield of endoscopic ultrasound (EUS)-guided liver biopsy (LB) in parenchymal disease evaluation has been previously studied, although with large-gauge needles and in retrospective or ex-vivo studies. In a prospective study, we evaluated the feasibility, safety and diagnostic adequacy of EUS-LB using a small caliber, 22-gauge (22-G) needle, in patients with nonalcoholic fatty liver disease (NAFLD) and suspected early-stage fibrosis. A validated histopathologic NAFLD scale served as a benchmark to evaluate adequacy of acquired tissue.

METHODS In a prospective cohort of NAFLD patients with well-documented steatohepatitis and suspected early liver fibrosis based on magnetic resonance elastography (MRE), EUS-LB procedures were performed using a standard linear-array echoendoscope (Pentax EG-3870UTK; Pentax Medical Co., Montvale, New Jersey), and biopsies were obtained from the left hepatic lobe using a 22-gauge core biopsy needle (SharkCore, Medtronic, Sunnyvale, CA). All samples were evaluated prospectively by an experienced liver pathologist, blinded to the clinical status of the patient and the MRE/EUS results. Total aggregate sample length (TASL), number of complete portal triads (CPT), adequacy of samples (number of CPTs >= 11), ability to calculate NAFLD Activity Score (NAS), and stage of fibrosis were evaluated and compared to the performance of MRE. Patients were monitored post biopsy for adverse events.

RESULTS A total of 36 EUS-LB samples were obtained. The median (IQR) total aggregate sample length (TASL) was 2.3 cm (2, 2.6). The median number of complete portal tracts (CPT) per TASL was 25 (17, 35). Of samples, 95% were adequate per AASLD criteria, and 100% were adequate to call NAS score and a fibrosis stage. All samples provided sufficient tissue to allow the application of next-generation metabolomic and lipidomic testing (figure). Compared with MRE, EUS-LB established stage 1-3 fibrosis in 10 cases that MRE classified as normal. The Pearson correlation showed a positive correlation of 0.6 (95% CI: 0.31-0.77, p=0.0002) between the two methods for diagnosing the same fibrosis stage. We found that 35% of the variance is shared between EUS-LB-staged fibrosis and MRE-staged fibrosis (r^2= 0.35). EUS-LB related adverse events occurred in 5%, and were restricted to post-procedural pain without any serious adverse events.

CONCLUSION

In this prospective study, we demonstrate that EUS-LB is not only safe and feasible using a smaller 22-gauge needle, but provides adequate tissue for full clinical assessment in 95% of cases. EUS-LB also provides sufficient tissue for next-generation testing in in NAFLD patients.

Interventional EUS

- Tissue acquisition
  - Liver Biopsy
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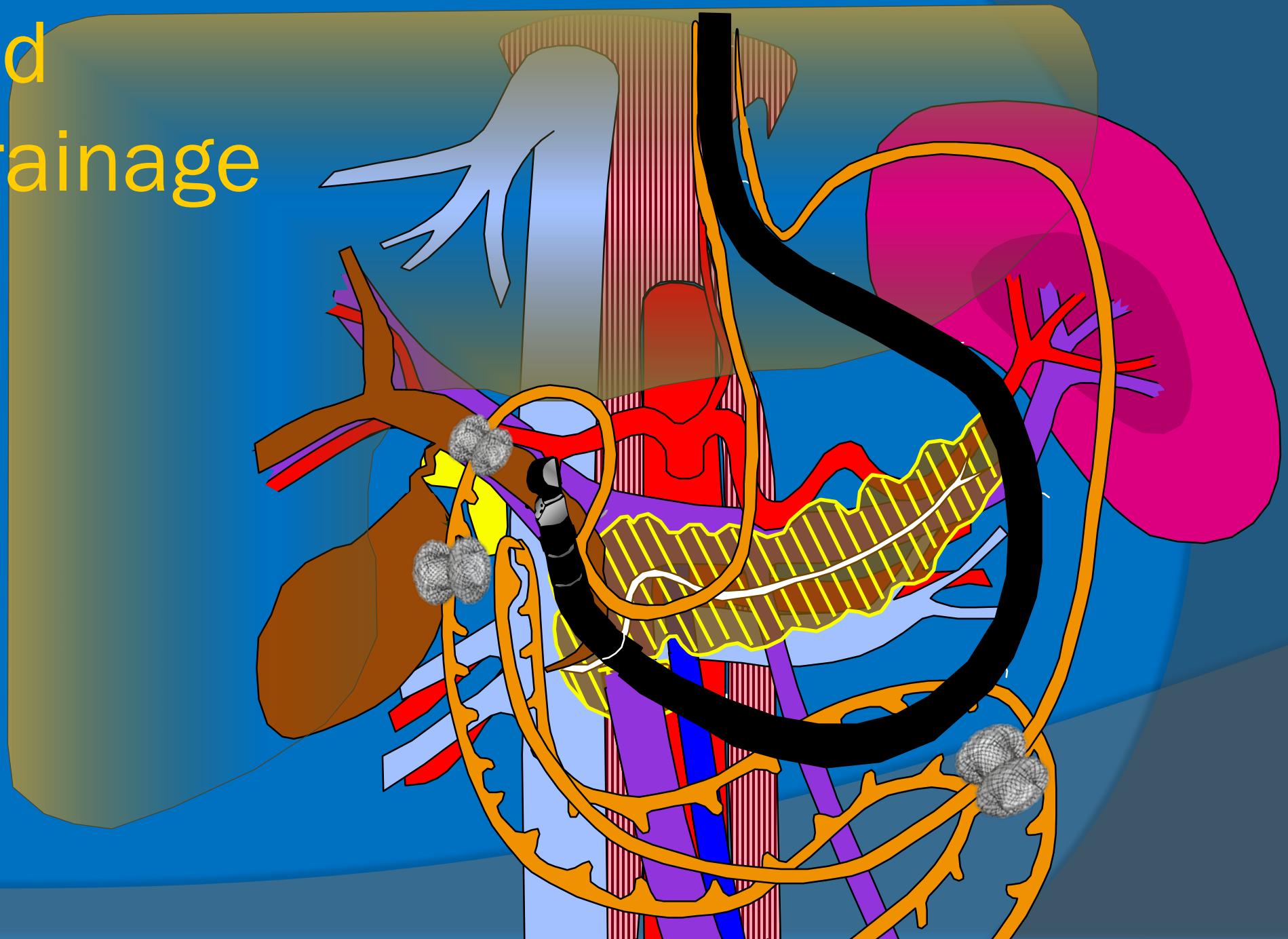
  - Portal Vein Injection

EUS-guided Access/Drainage



EUS GB Drainage (EUS-GBD)

- Consider in high risk patients with cholecystitis that are NOT surgical candidates
- Appears to have similar efficacy to percutaneous gallbladder drainage (PC-GBD)
- EUS-GBD trending to have less adverse events and repeat procedures compared to PC-GBD.

EUS 12; Abs #173

Take Home:

- 371 pts EUS-GBD
- Axios used in 70%
- Technical success 92%
- Clinical success 88%
- 30-day AE = 13%
- 30-day mortality = 9%
- Clinical success & Endoscopist experience important predictor of 30-day AE

OUTCOMES OF AN INTERNATIONAL MULTI-CENTERED REGISTRY ON EUS-GUIDED GALLBLADDER DRAINAGE IN PATIENTS THAT ARE UNFIT FOR CHOLECYSTECTOMY

Presentation Number: 173

Anthony Y.B. Teoh[1], Manuel Perez-Miranda[2], Rastislav Kunda[3], Sang Soo Lee[4], Shayan S. Irani[5], Paul Yeaton[6], Todd H. Baron[7], Siyu Sun[8], Rungsun Rerknimitr[9], Jong Ho Moon[10], Bronte Holt[11], Christopher Jen Lock Khor[12], Amol Bapaye[13], Shannon M. Chan[1], Hyun Jong Choi[10], Theodore James[7], Pradermchai Kongkam[9], Yun Nah Lee[10], Wiriyapom Ridtitid[9], Carlos De la Serna[2], Damien Meng Yew Tan[12], Raúl Torres-Yuste[2]

Background EUS-guided gallbladder drainage (EGBD) is gaining popularity as a means of achieving gallbladder drainage in patients suffering from acute cholecystitis that are unfit for cholecystectomy. However, most of the published studies only included small number of patients using one type of stent with a short follow-up. Hence, the aim of the current study is to review the outcomes of a large scale international registry on EUS-guided gallbladder drainage that encompasses different stent systems.

Methods This was a retrospective international multi-centered cohort study conducted in 12 institutions. Consecutive patients that received EGBD for symptomatic gallstones, acute cholecystitis or conversion of PC were included. EGBD was performed with a variety of stents including HOT AXIOS (Boston Scientific, Marlborough, USA), SPAXUS (Niti-S, Taewoong Medical, Korea), BONA-AL stent (Standard Sci Tech Inc., Seoul, Korea) and the Microtech stent (Nan Jing Co. Ltd., China). Outcomes reviewed include technical and clinical success, adverse events, mortality, re-interventions rates, recurrence rates and learning curve of the procedure.

Results Between June 2011 and November 2017, 371 patients were recruited to the study. The mean (S.D.) age was 73.6 (15.1) years old and 51.1% patients were male. The mean (S.D.) age-adjusted Charlson comorbidity index was 5.6 (3.2). The types of stents used were AXIOS (70.1%), SPAXUS (8%) and others (17.7%). The overall technical success and clinical success rates were 92.3% and 88.4% respectively. Unplanned procedural events occurred in 10.6% patients. The mean follow-up duration was 490.9 (542.1) days. The 30-day adverse event rate was 13.5% and 30-day mortality was 9%.

The risk of unplanned procedural events was significantly higher in patients that received EGBD performed for symptomatic gallstones and conversion of PC ($P < 0.001$). When comparing between different stent systems, significant differences were noted in endoscopist experience ($P < 0.001$) and 30-day adverse events ($P = 0.026$). The unplanned procedural events ($P = 0.043$), clinical success ($P = 0.037$) and mortality ($P = 0.057$) were significantly worst with experience of less than 25 procedures. On multinominal regression analysis, both endoscopist experience ($P = 0.027$) and clinical success ($P = 0.003$) were predictors to 30-day adverse events, whilst clinical success ($P < 0.001$) was the only significant predictor to mortality.

Conclusion EGBD was effective for treatment of acute cholecystitis that are at high-risk for cholecystectomy. EGBD done for other indications were technically more difficult. Outcomes of different stent systems were similar. The endoscopist experience is an important parameter to outcomes and the number of cases required to gain competency of the technique is 25 patients.

EUS 13; Abs #166

Take Home:

- 45 pts (24 EUS-GBD vs 21 EUS-GBD + ERCP)
- No difference in technical or clinical success of GBD (>90%)
- No difference in AE or technical issues (~20%)

SAFETY AND EFFICACY OF EUS-GUIDED GALLBLADDER DRAINAGE (EUS-GBD) COMBINED WITH ERCP IN THE SAME SESSION

Presentation Number: 166

Raúl Torres-Yuste[1], Francisco Javier Garcia-Alonso[1], Marta Cimavilla[1], Ana Yaiza Carbajo López[1], Natalia Mora[1], Irene Penas-Herrero[1], Ramón Sánchez-Ocaña[1], Sergio Sevilla-Ribota[1], Carlos De la Serna[1], Manuel Perez-Miranda[1]

[1]Gastroenterology and Hepatology, Hospital Universitario Río Hortega, Valladolid, Castilla y Leon, Spain;

Introduction. ERCP is increasingly being combined in a single-session with other endoscopic procedures such as EUS (staging, screening for CBD stones, rendezvous for failed cannulation) duodenal stenting or cholangioscopy. EUS-guided gallbladder drainage (EUS-GBD) is an emerging option for acute cholecystitis in non-surgical candidates. Patients with acute cholecystitis often need CBD stone removal. Combination of ERCP for CBD stones and EUS-GBD might be appealing in some patient subsets, but there is virtually no objective evidence to support this combined approach to gallstone disease.

Aim. To assess the safety and efficacy of EUS-GBD combined with ERCP in the same session.

Patients and methods. Single-center retrospective cohort study comparing outcomes of EUS-GBD alone to those of ERCP combined with EUS-GBD in the same session between June 2011 and May 2017. Lumen-apposing metal stent (LAMS, Axios®) were used in both groups. Exclusion criteria: ERCP or EUS-GBD used for salvage of one another (ie, transcystic GB drainage after failed EUS-GBD or EUS-GBD for failed biliary drainage at ERCP), EUS-guided biliary drainage (EUS-BD) in the same session, and ERCP within 5 days (before/after) EUS-GBD. Epidemiologic, procedural, and clinical outcome data were analyzed with Wilcoxon, Chi-square and Fisher tests where appropriate. Primary endpoints were rates of technical success, clinical success and adverse events.

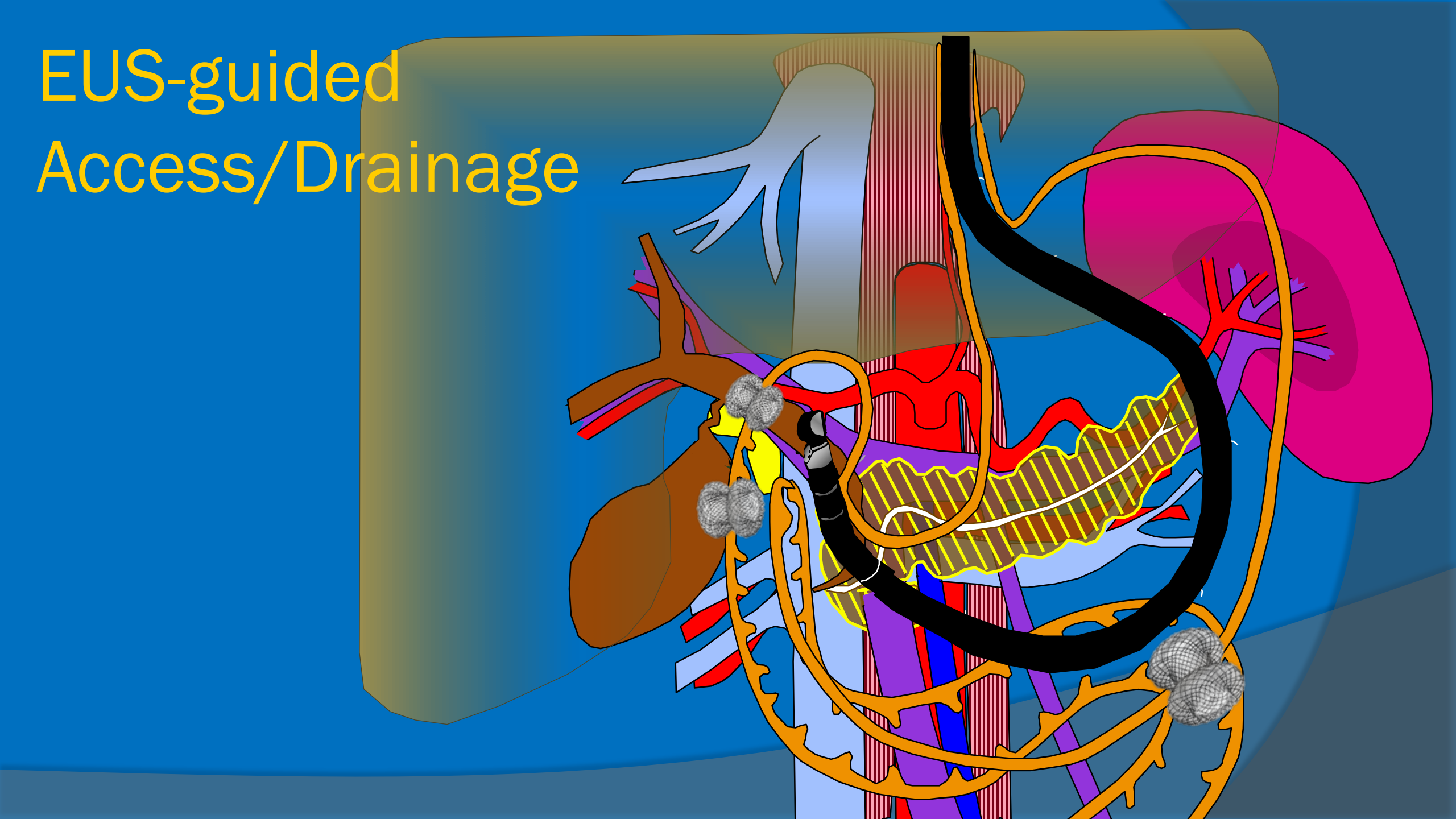
Results. Sixty-four consecutive patients underwent EUS-GBD between June 2011 and May 2017. 18 Patients were excluded: in 11 the indication for either ERCP or EUS-GBD was salvage of a failed tandem procedure, 5 had EUS-guided biliary drainage in the same session and a further 3 had another ERCP within 5 days of the index procedure. Forty-five patients met inclusion/exclusion criteria: 24 EUS-GBD and 21 EUS-GBD combined with ERCP.

Baseline characteristics were comparable in both groups. There were no significant differences in technical (100% vs 91.7%) and clinical success rates (90.5% vs 91.7%) of EUS-GBD in the combined versus the single procedure groups. The rate of adverse events (19.8% vs 20.9%) and the rate of technical issues (14.3% vs 37.5%; p=0.10) during LAMS deployment were also comparable. Results are detailed in Table 1.

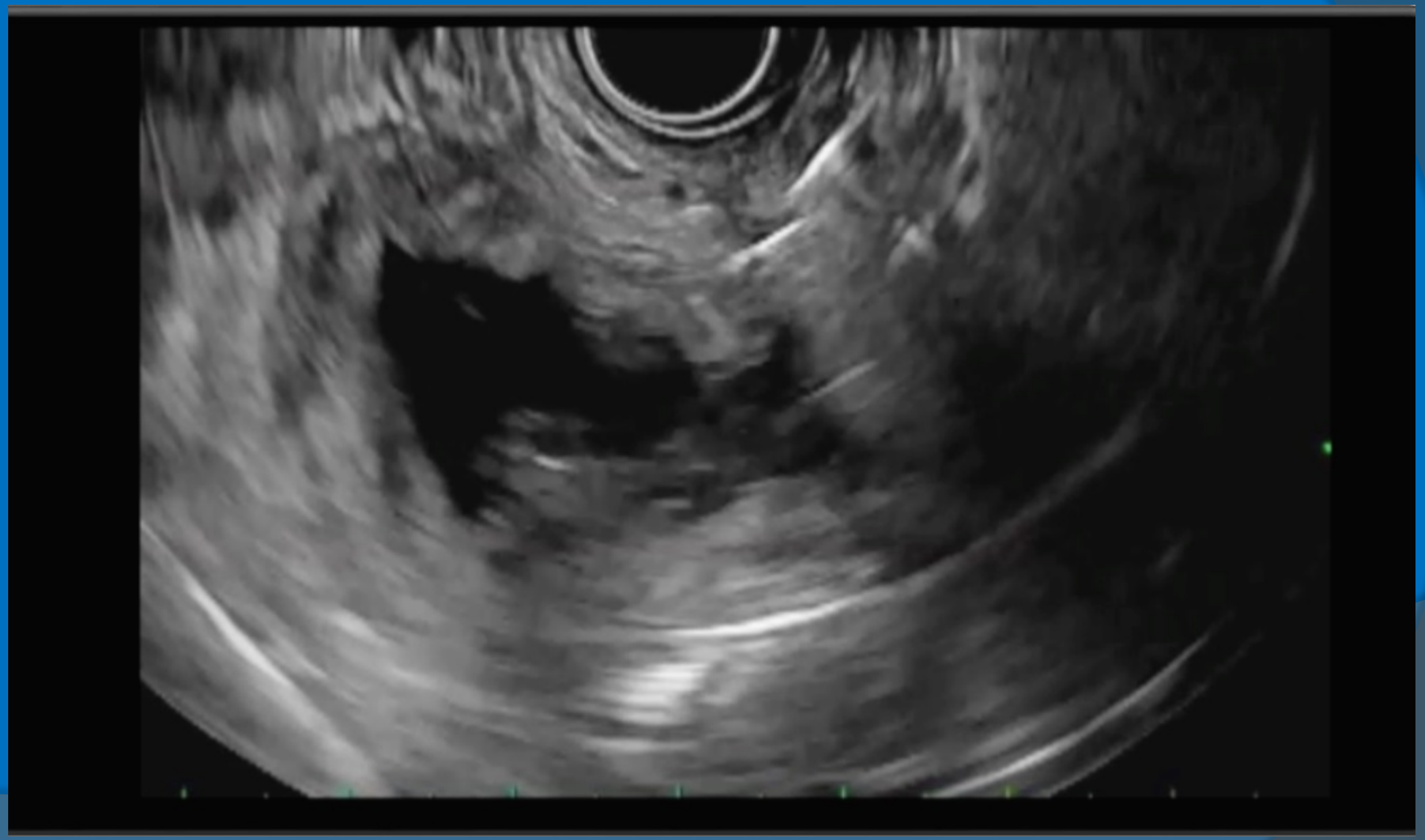
Technical success of ERCP was 100%. Details of ERCP are described in Table 2.

Conclusions. While ERCP combined with EUS-GBD maintains similar rates of technical and clinical success to EUS-GBD alone, a combined procedure does not appear to increase adverse events. Despite the limitations of our study, these findings are encouraging and warrant further evaluation before this therapeutic approach can be generalized.

EUS-guided Access/Drainage



EUS-guided gastro-enterostomy



EUS 14; Abs #68 & 174

Take Home:

- 100 pts with GOO
  - 78 pts enteral stent
  - 22 pts EUS-GJ
- Both technical success 100%
- Higher clinical success in EUS-GJ (92% vs 69%) p=.036
- Lower stent failure in EUS-GJ (8% vs 32%)
- Should be offered as alternative in pts with GOO

EUS-GUIDED GASTROJEJUNOSTOMY WITH LUMEN APPOSING METAL STENT VERSUS ENTERAL STENT PLACEMENT FOR PALLIATION OF MALIGNANT GASTRIC OUTLET OBSTRUCTION

Presentation Number: 68

Phillip Ge[1], Joyce Y. Young[1], William Dong[1], Christopher C. Thompson[1]
[1]Brigham & Women's Hospital, Boston, Massachusetts, United States;

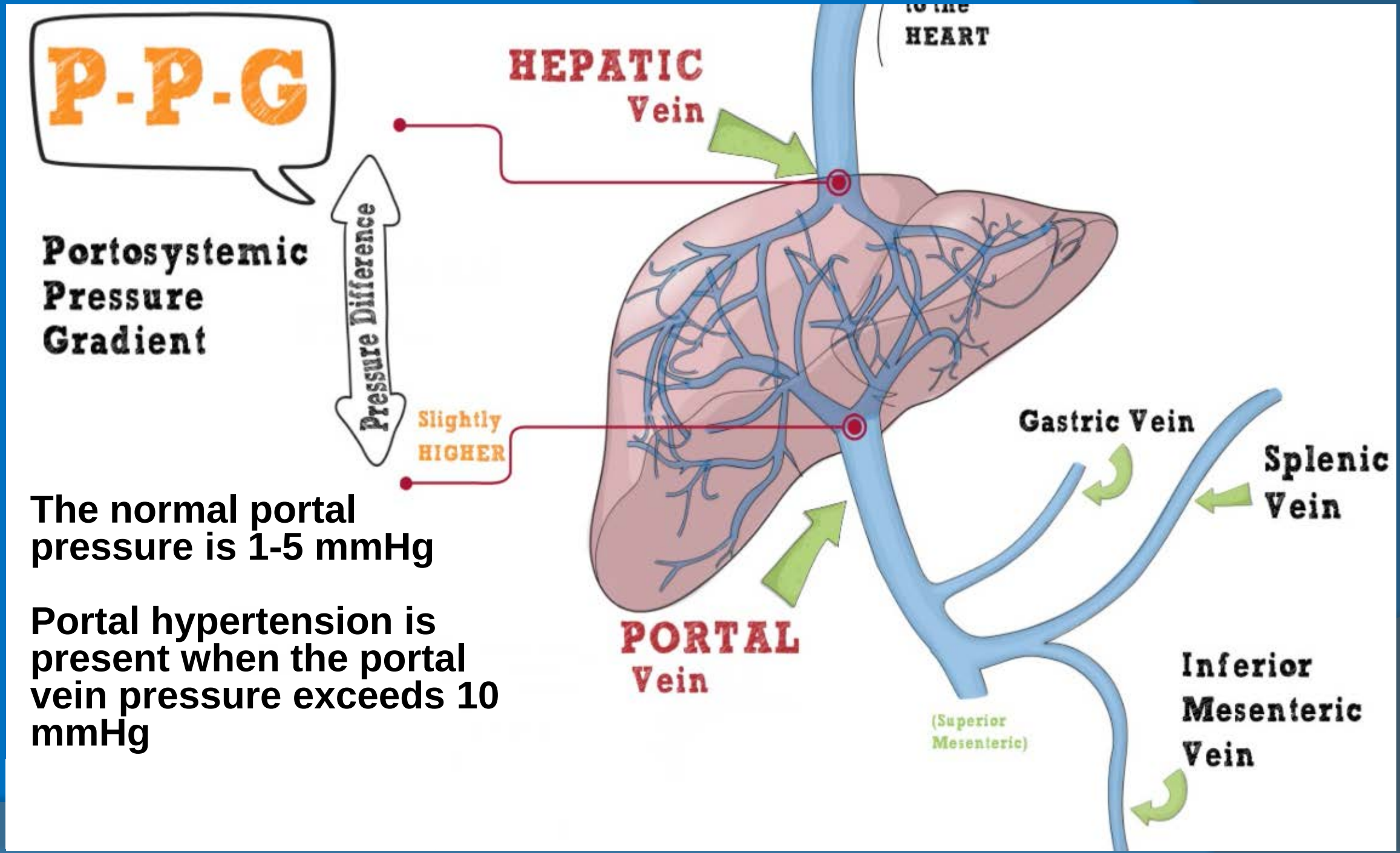
Background: Enteral stent placement is commonly performed for palliation of obstructive symptoms caused by malignant gastric outlet obstruction (GOO). EUS-guided gastrojejunostomy (EUS-GJ) with placement of a lumen-apposing metal stent (LAMS) is a novel procedure that may offer long lasting patency with fewer incidence of stent failure, however there is limited data comparing EUS-GJ to enteral stent placement.
Aim: To compare clinical outcomes and adverse events between EUS-GJ and enteral stent placement in the endoscopic palliation of malignant GOO.
Methods: A prospectively collected university health care system registry was queried for LAMS, enteral stents, and GOO, and a retrospective analysis was performed. Patients who underwent EUS-GJ and enteral stent placement for the palliation of malignant GOO from 2014-2017 were included. Patients with benign GOO, gastroparesis, or surgically altered anatomy were excluded. Demographics, procedural and technical characteristics, and relevant clinical outcomes were recorded. Adverse events were assessed. Characteristics and clinical outcomes were compared using Fisher's exact test and Student's *t*test when appropriate.
Results: A total of 100 consecutive patients who underwent endoscopic palliation of malignant GOO during the study period were analyzed, of which 78 patients underwent enteral stent placement, and and 22 patients underwent EUS-GJ. Mean age was 65.9 ± 11.9 years, and 44.0% of patients were female. A total of 121 stents were placed, including 24 LAMS in the EUS-GJ group and 97 uncovered self expanding metal stents in the enteral stent group. When comparing EUS-GJ and enteral stent cases, technical success was achieved in 100% in both groups, however higher clinical success was attained in the EUS-GJ group compared to enteral stent group (91.7% vs 69.1%, $p = 0.036$). Mean length of hospital stay following stent placement was similar between the two groups ($p = 0.821$). The rate of stent failure requiring repeat intervention was significantly higher in the enteral stent group (31.6% vs 8.0%, $p = 0.021$). The enteral stent group had greater number of adverse events (40.2% vs 20.8%, $p= 0.098$) and incidence of stent ingrowth (16.5% vs 4.2%, $p = 0.189$), however this did not reach statistical significance. Misdeployment resulting in perforation occurred in two cases of EUS-GJ, however both cases were managed endoscopically with subsequent successful LAMS deployment in the same session, and neither case required surgery.
Conclusions: When compared to enteral stent placement, EUS-GJ has higher rate of initial clinical success and lower rate of stent failure requiring repeat intervention. EUS-GJ should be offered as a minimally invasive alternative for selected patients with malignant GOO in centers with extensive experience.

Interventional EUS

- Tissue acquisition
  - Liver Biopsy
- Injection
  - Neurolysis
  - Anti-tumor agents
- Access/Drainage
  - Pseudocyst
  - Biliary/pancreatic ducts
  - Gallbladder
  - Gastro-enterostomy
- Ablation
  - PDT
  - Laser
  - RFA
  - Cryotherapy
- Vascular
  - Varices
  - Portal Vein Sampling
  - Portal Vein Pressure
  - Portal Vein Injection

EUS-guided porto-systemic gradient (PPG)

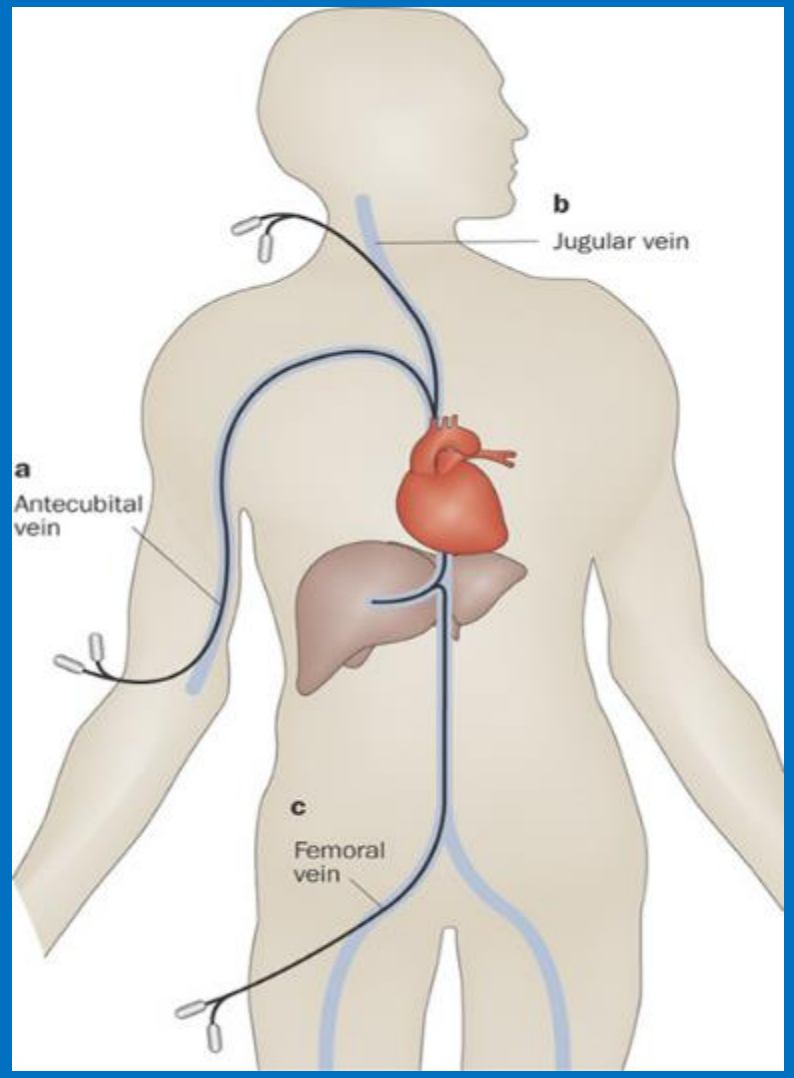
- Portal hypertension (PH) is a serious complication of liver cirrhosis.
- The hepatic venous pressure gradient (HVPG) accurately reflects the degree of PH
- Single best prognostic factor in liver disease
- Guides medical therapy
- Predicts liver decompensation & cancer risk

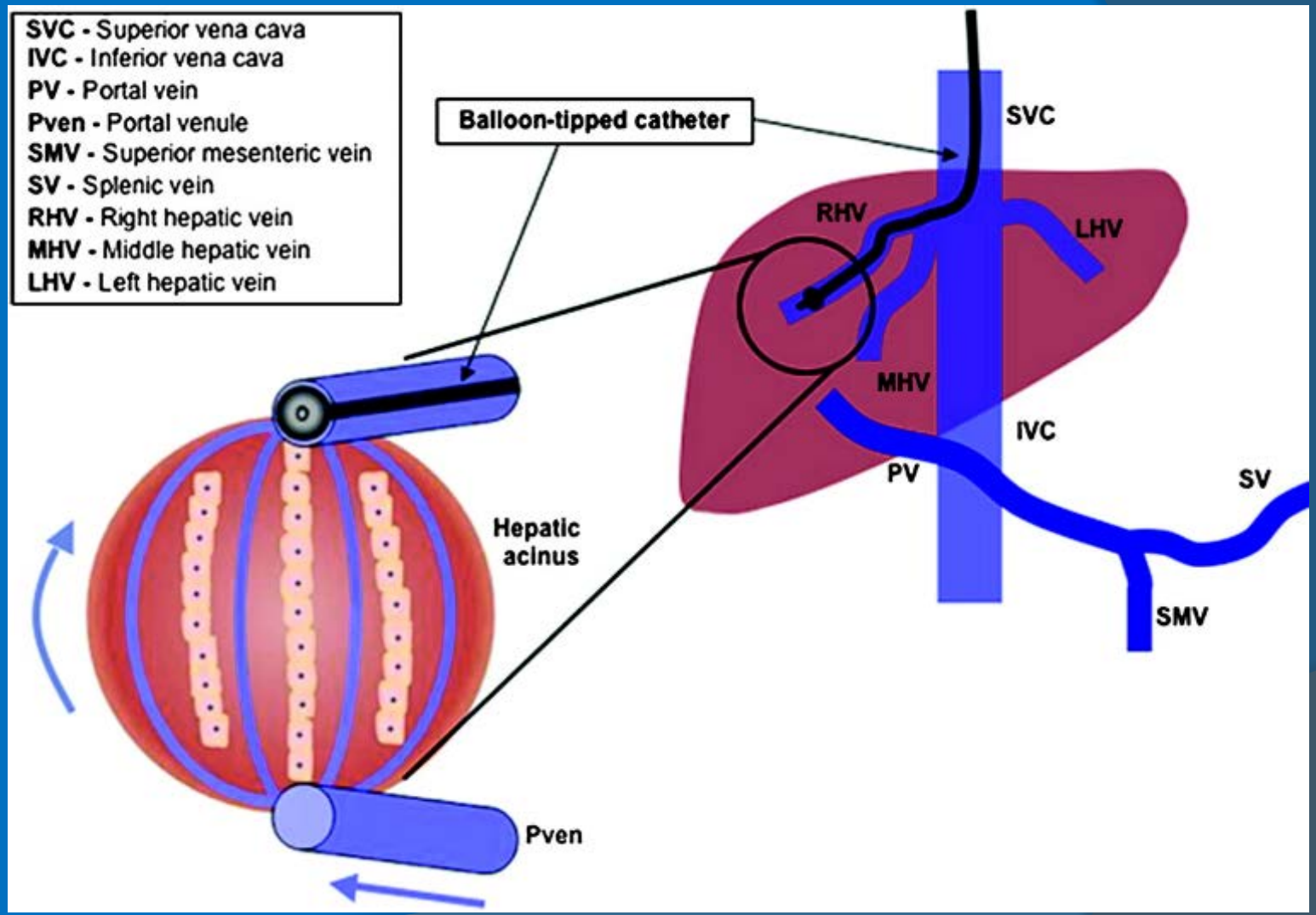


The normal portal pressure is 1-5 mmHg

Portal hypertension is present when the portal vein pressure exceeds 10 mmHg

Current Practice – Transjugular HVPG





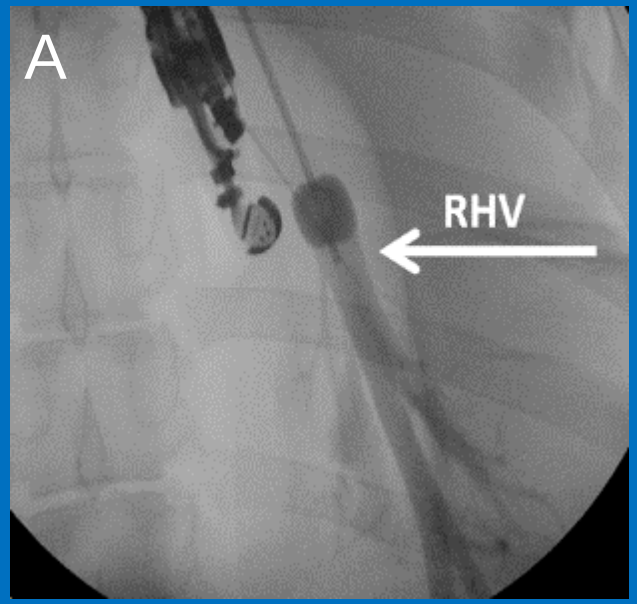
2009 Nature Reviews Gastroenterology & Hepatology #38

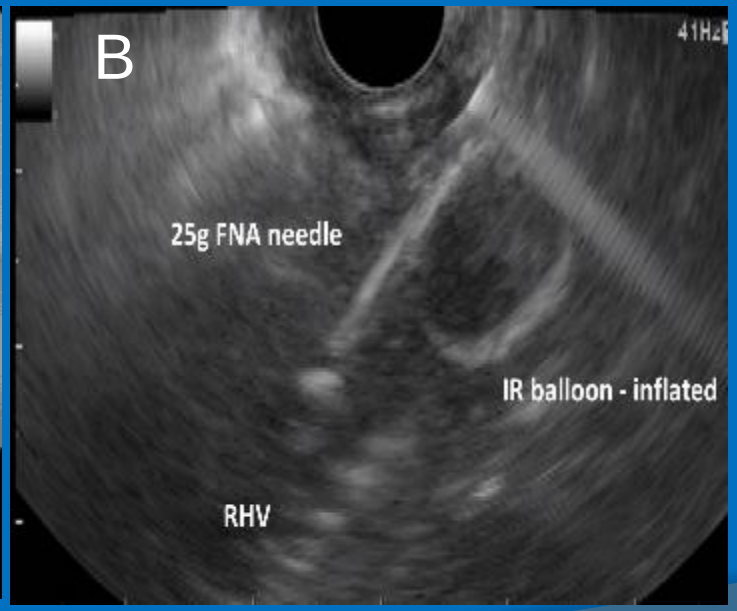
EUS-PPG

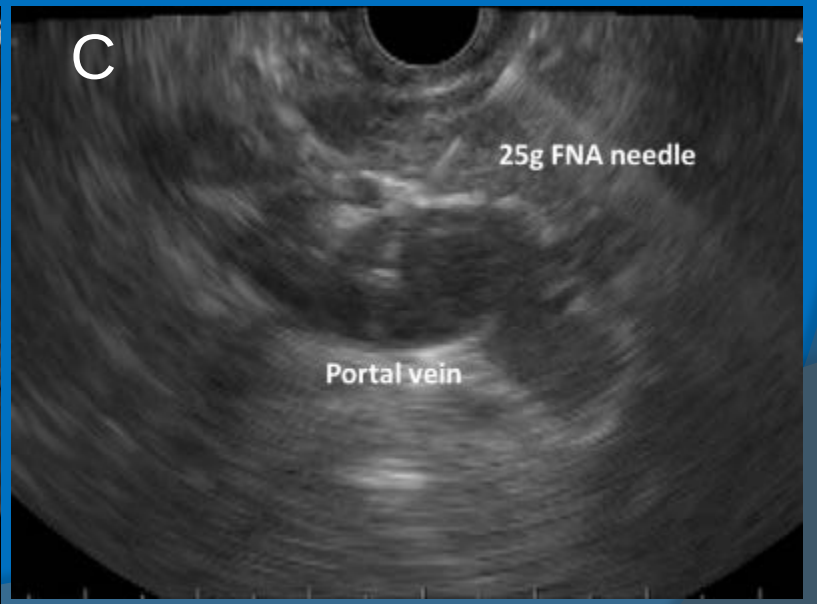
EUS-guided portal pressure gradient measurement with a novel 25-gauge needle device versus standard transjugular approach: a comparison animal study

Jason Y. Huang, FRACP, Jason B. Samarasena, MD, Takeshi Tsujino, MD, Kenneth J. Chang, MD

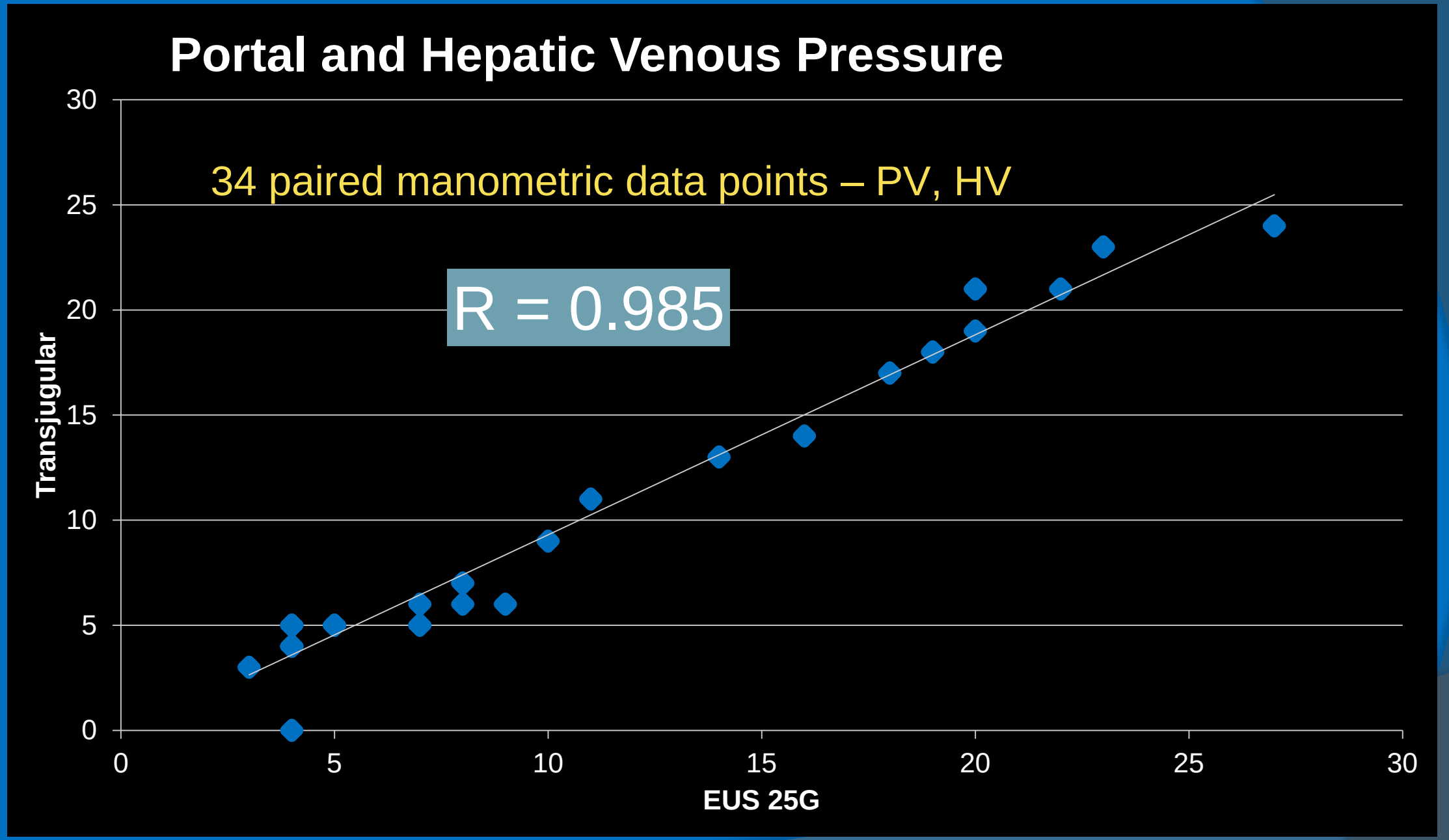
- Compared EUS-PPG vs
- Simultaneous Transjugular balloon catheter







GIE 2016:84:2: 358-62



GIE 2016:84:2: 358-62

EUS-guided portal pressure gradient measurement with a simple novel device: a human pilot study

Jason Y. Huang, FRACP,[1] Jason B. Samarasena, MD,[1] Takeshi Tsujino, MD, PhD,[1] John Lee, MD,[1] Ke-Qin Hu, MD,[1] Christine E. McLaren, PhD,[2,3] Wen-Pin Chen, MS,[3] Kenneth J. Chang, MD[1]

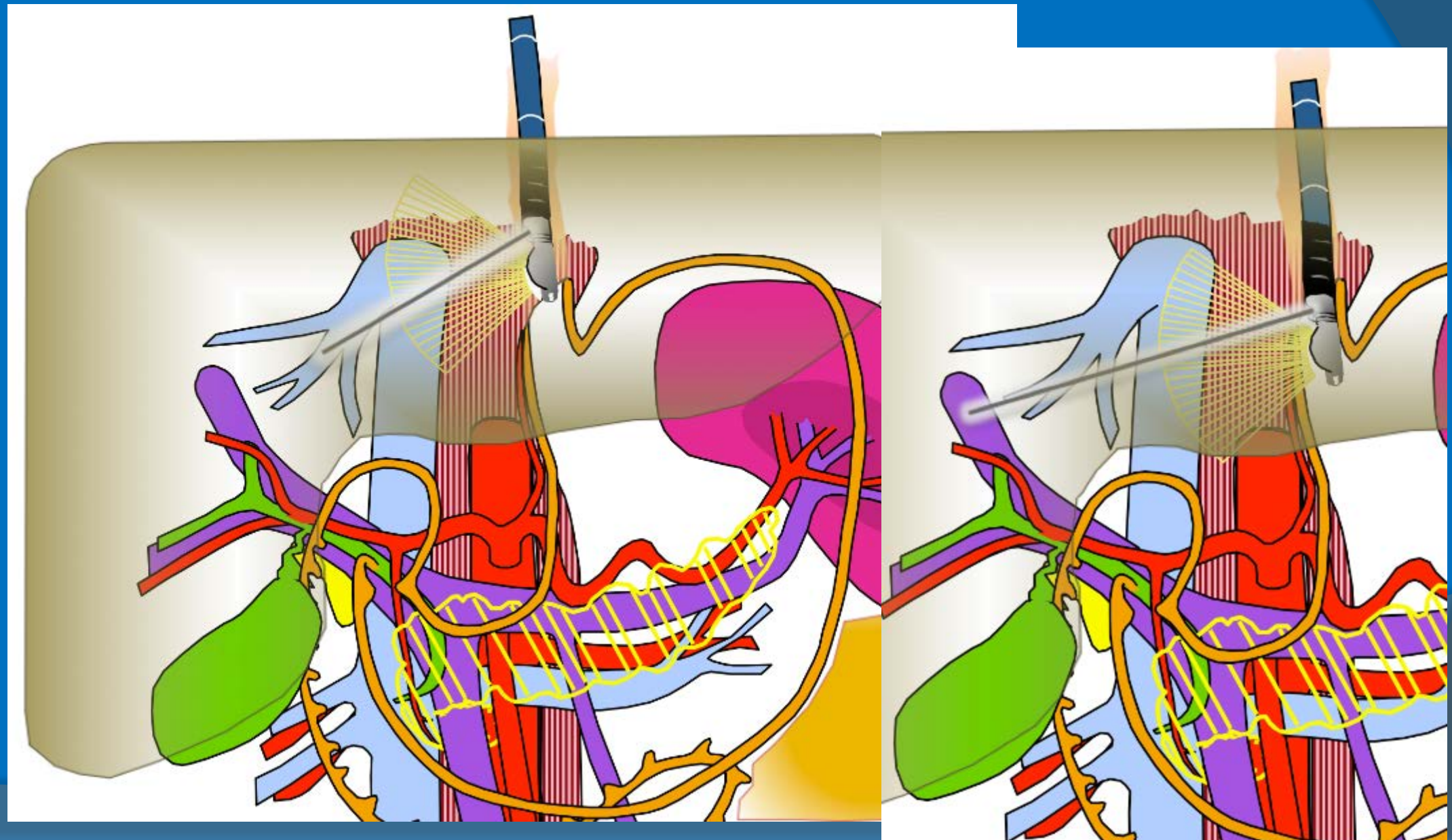
Irvine, California, USA

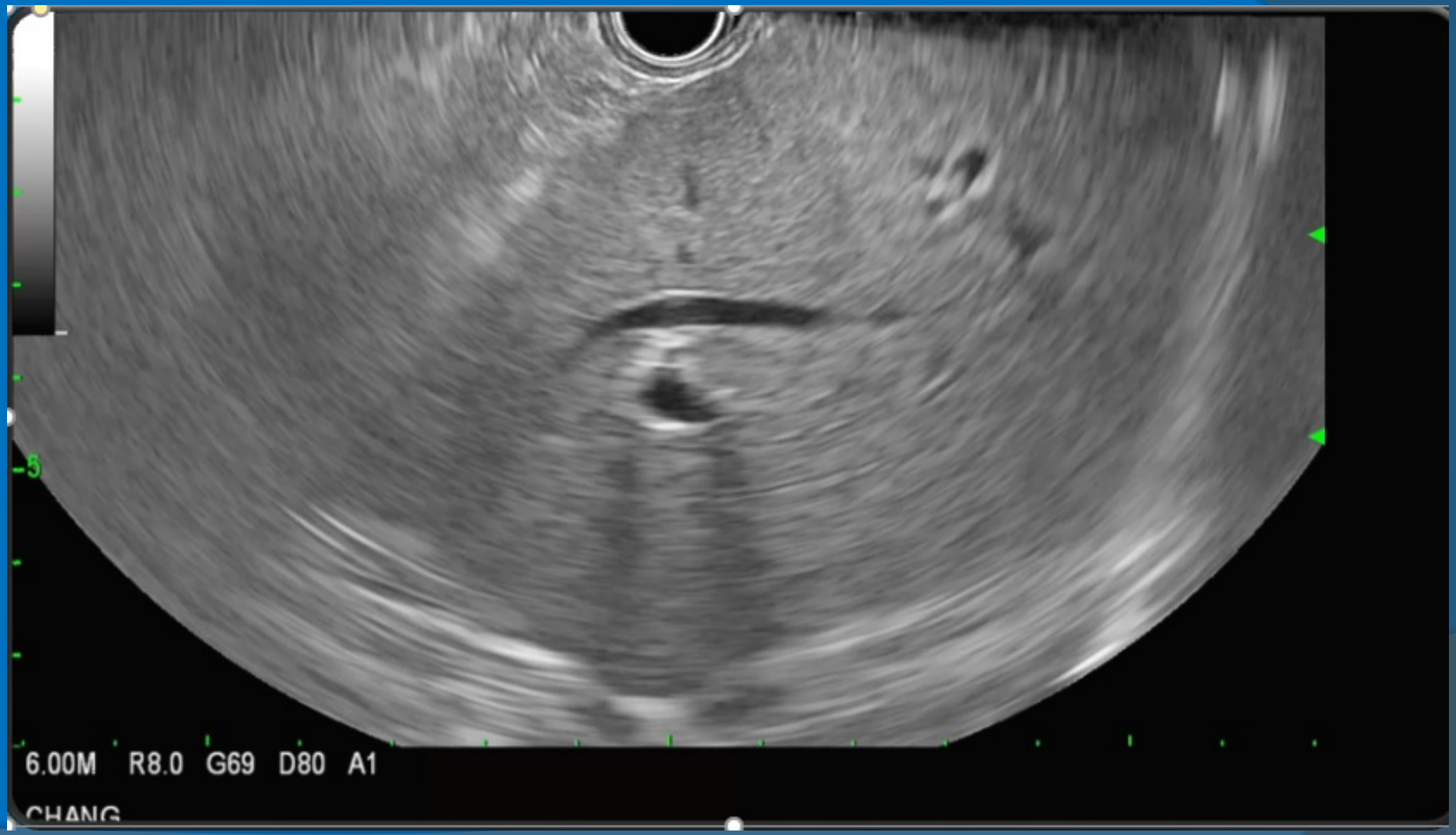
AIMS:

- To evaluate the feasibility and safety of EUS–PPG technique in humans
- To correlate EUS-PPG with endoscopic and clinical evidence of PH in patients with liver disease

GIE 2017;85:996-1001

EUS-PPG

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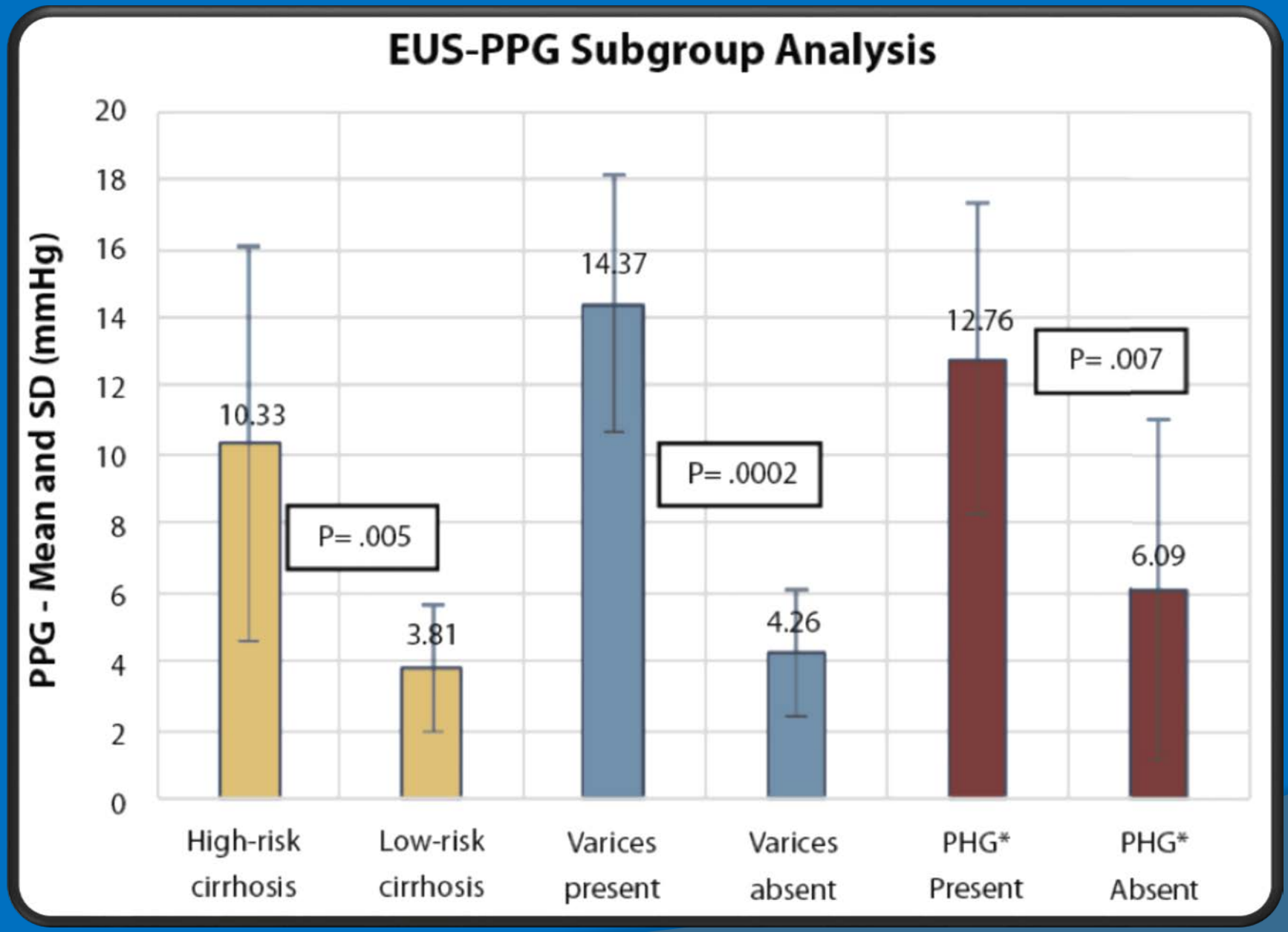
6.00M R8.0 G69 D80 A1
CHANG

Results

- All 28 subjects underwent EUS-PPG with 100% technical success
  - Identifying and accessing targeted vessels
  - Obtaining Manometric pressures
- There were no complications
- PPG range was 1.5-19mmHg



p-value of Wilcoxon Rank Sums test

Conclusions

- In this human pilot study, the novel technique of EUS-guided PPG using a 25G needle and compact manometer was feasible and appeared safe.
- EUS-PPG values showed excellent correlation with clinical parameters of PH.

EUS 15; Abs #647

Take Home:

- 51 pts EUS-PPGM
- 100% technical success
- No AE
- PPG (0-27 mmHg)
- Safe and correlates well with clinical markers of portal HTN

EUS-GUIDED PORTAL PRESSURE GRADIENT MEASUREMENT: A SINGLE CENTER EXPERIENCE

Presentation Number: 647

Jason B. Samarasena[1], James Yin Han[1], Anish Patel[1], Kyle J. Fortinsky[1], Toshitaka Shimizu[1], Ke-Qin Hu[1], Jason Y. Huang[1], Kenneth J. Chang[1]
[1]Gastroenterology and Hepatology, University of California, Irvine, Orange, California, United States;

Background: Portal hypertension (PH) is a common complication of liver cirrhosis, which can lead to complications including ascites, variceal bleeding, encephalopathy, and hepatorenal syndrome. The portal pressure gradient (PPG) accurately reflects the degree of PH and is the single best prognostic indicator in liver disease. This measurement is usually obtained by interventional radiology (IR), although it is not routinely performed. Recently, we developed a simple novel technique for EUS-guided PPG measurement (EUS-PPGM) and showed that it is both feasible and safe in an initial human pilot study.
Aims: To evaluate the safety of EUS-PPGM and whether the measurement correlates with clinical features of portal hypertension in an expanded series.
Methods: EUS-PPGM was performed by two experienced endoscopists (JS and KC) using a linear echoendoscope, a 25-gauge fine-needle aspiration needle, and a novel compact manometer. The portal vein and hepatic vein (or inferior vena cava) were targeted under EUS-guidance using either a transgastric or transduodenal approach. Clinical parameters of PH were evaluated in each patient. Safety data was collected on each patient.
Results: 51 patients underwent EUS-PPGM with 100% technical success and no adverse events. PPG ranged from 0 to 27.3 mm Hg. The PPG was significantly higher in patients with clinical features of cirrhosis (11.26 vs. 3.14 mmHg, $p < 0.001$), endoscopic evidence of varices (14.94 vs. 4.09 mmHg, $p < 0.001$) or portal hypertensive gastropathy (14.37 vs. 5.23 mmHg, $p < 0.001$), and laboratory evidence of thrombocytopenia (10.91 vs. 4.81 mmHg, $p < 0.001$). Minor discomfort was reported in 3 patients (6%), which were all managed with oral pain medication. No patients developed bleeding or infection. No patients required admission to hospital as a result of the procedure.
Conclusion: EUS-PPGM correlates well with clinical markers of portal hypertension and appears to be safe in patients with cirrhosis. Given the availability of EUS and the simplicity of the manometry setup, EUS-guided PPG represents a promising breakthrough for procuring indispensable information in the management of patients with liver disease.

Endoscopic-Ultrasound-Guided Portal Injection Chemotherapy (EPIC) Using a Novel Biodegradable Microbead to Deliver Paclitaxel

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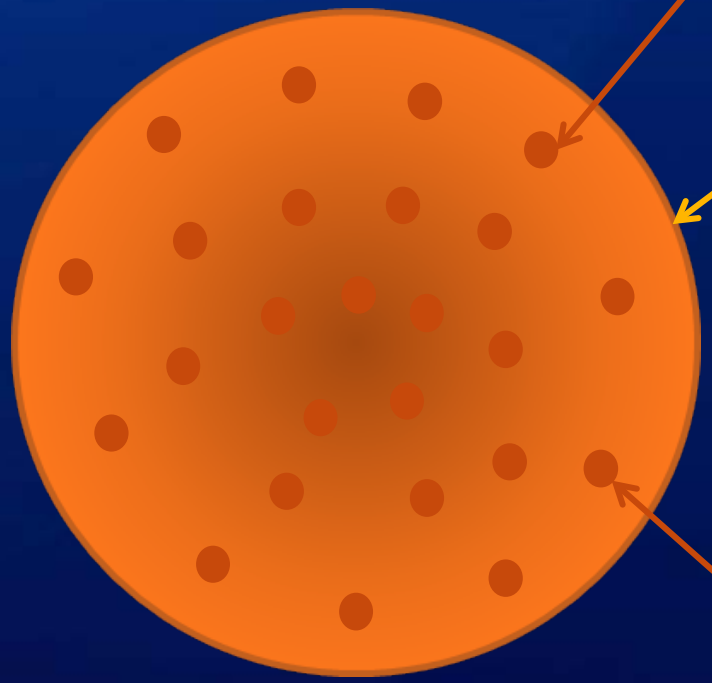
Oncosphere



Target Drug

Microsphere Encapsulation

Drug is released as polymer degrades

=

Precise Concentration of any Drug

=

Sustained Release of Drug

MAYO CLINIC

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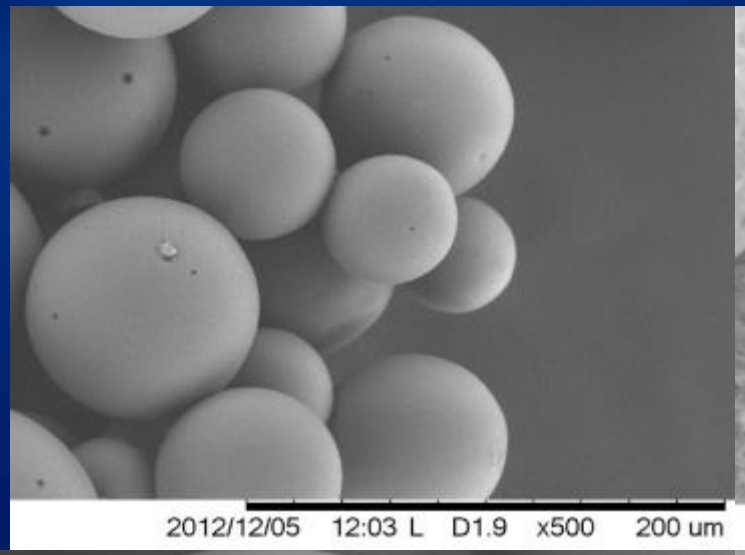
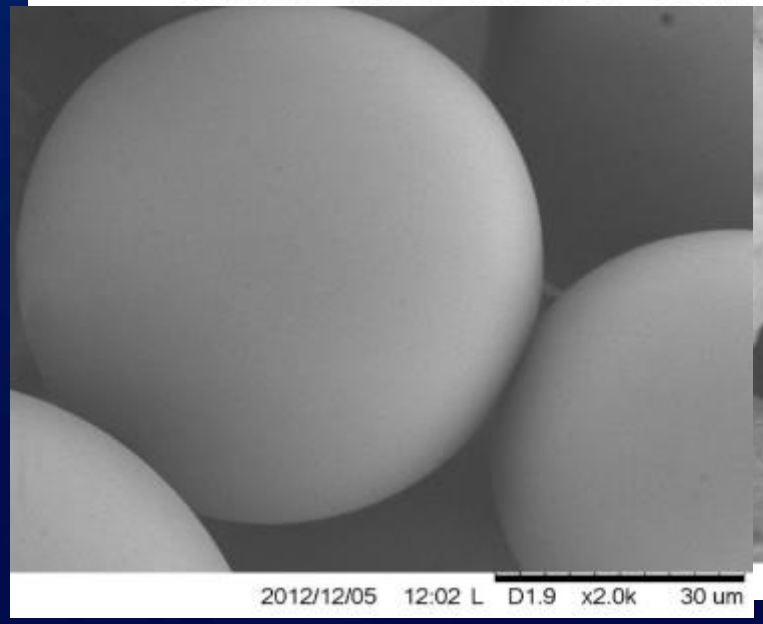
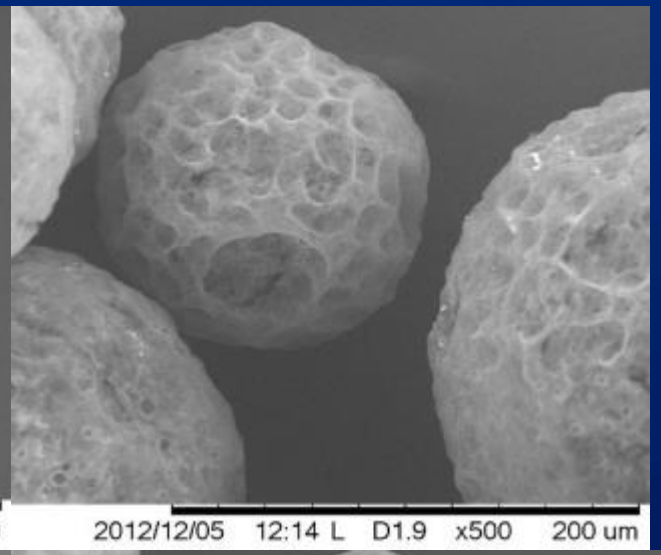
In Vitro Degradation of Oncosphere

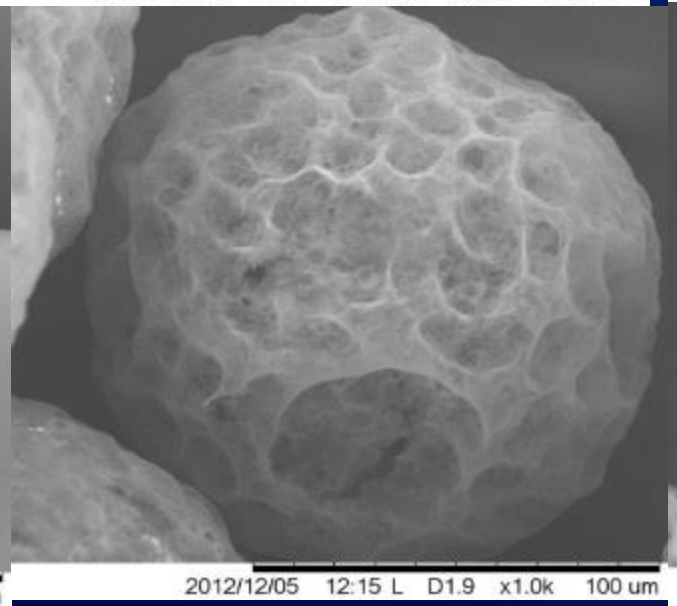
T = 0



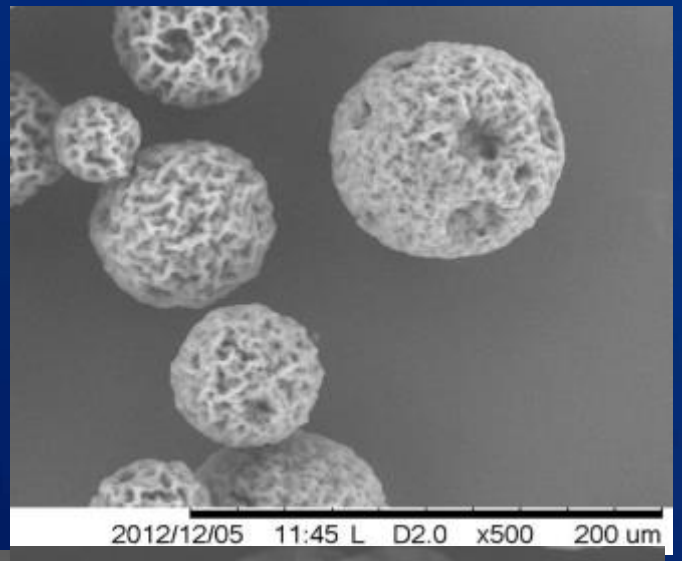


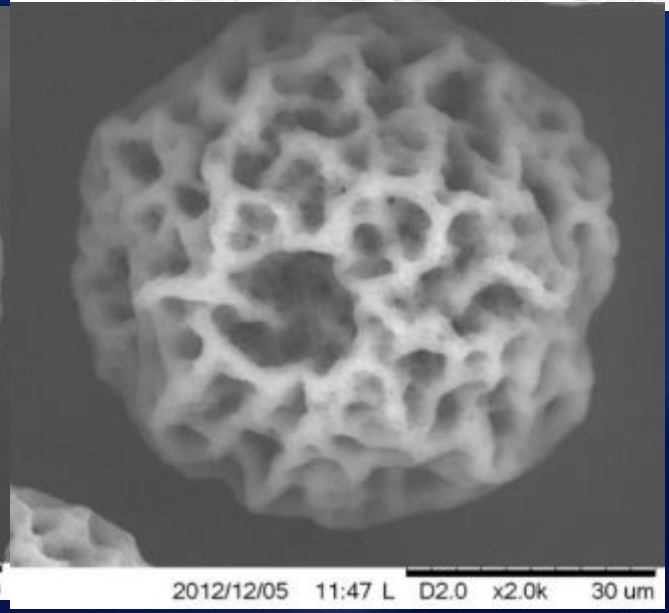
T= 2 weeks





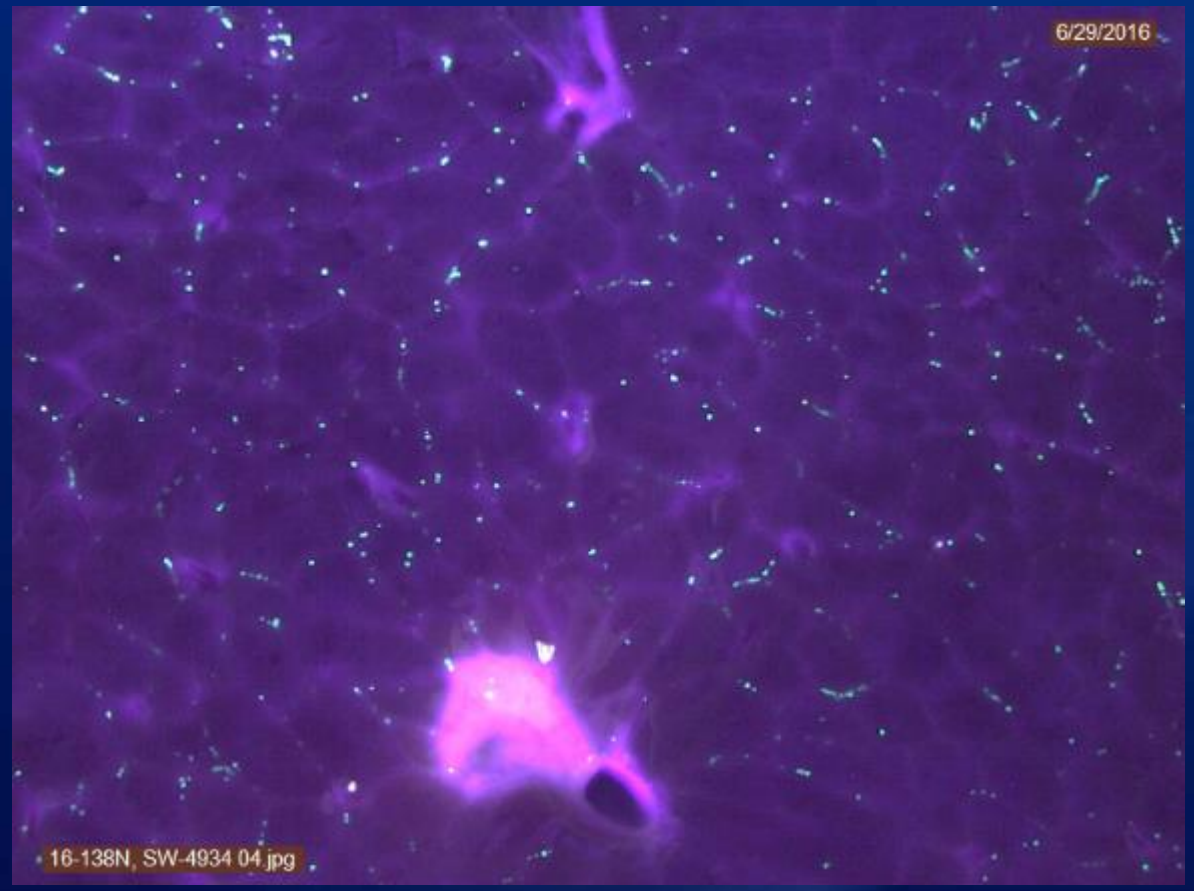
T=4 weeks





MAYO CLINIC

Portal Injection Oncosphere with Fluorescein



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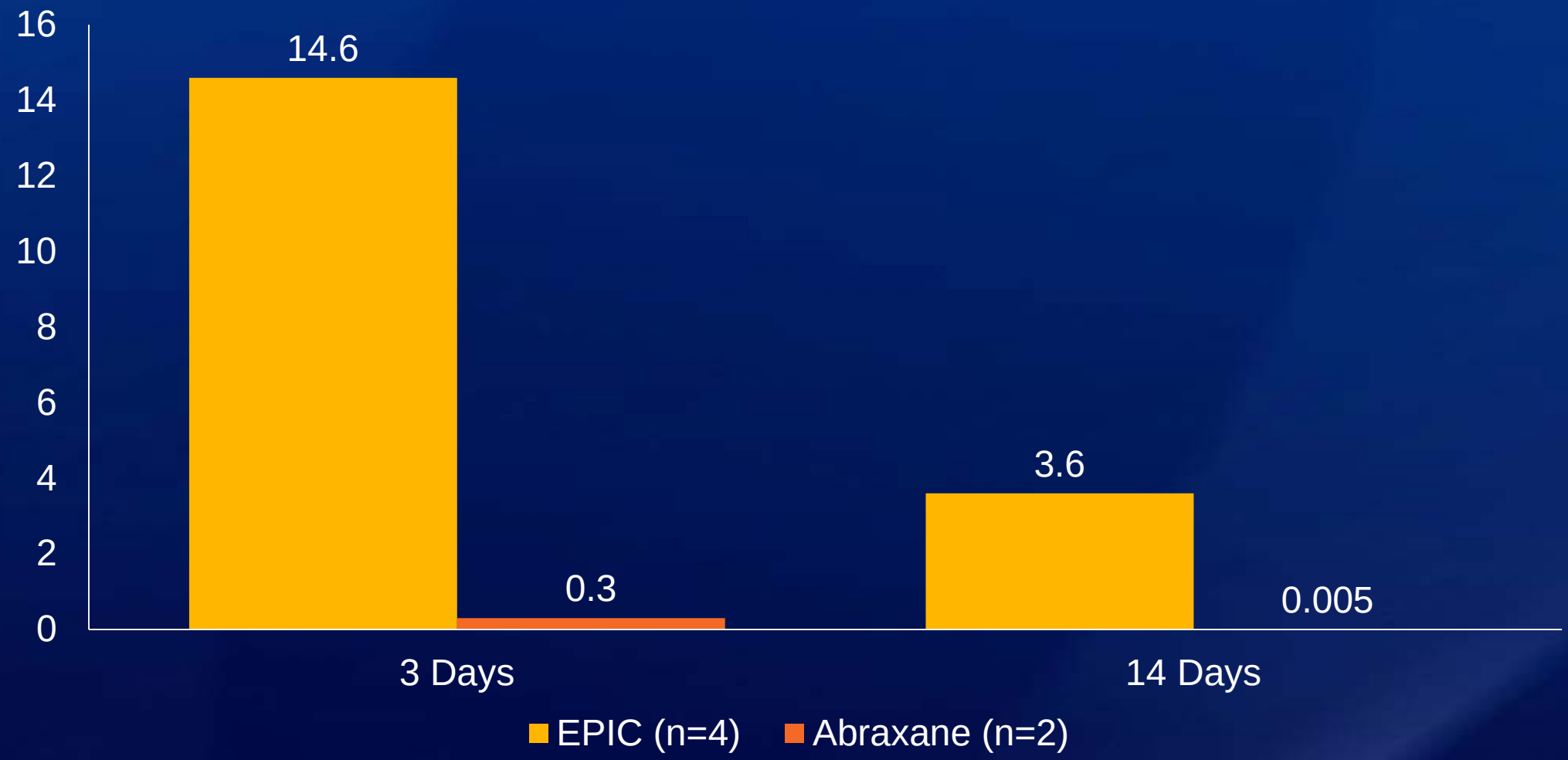
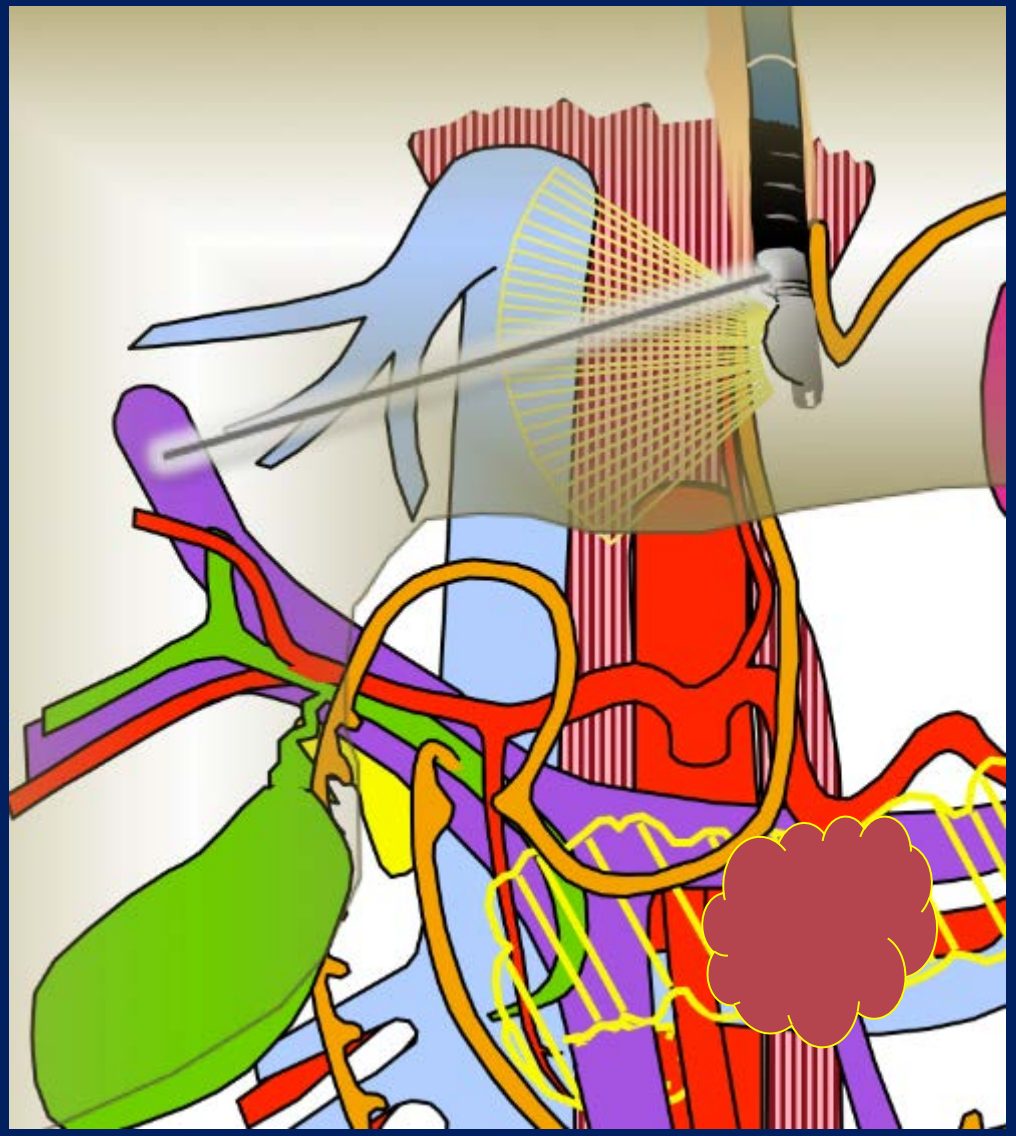
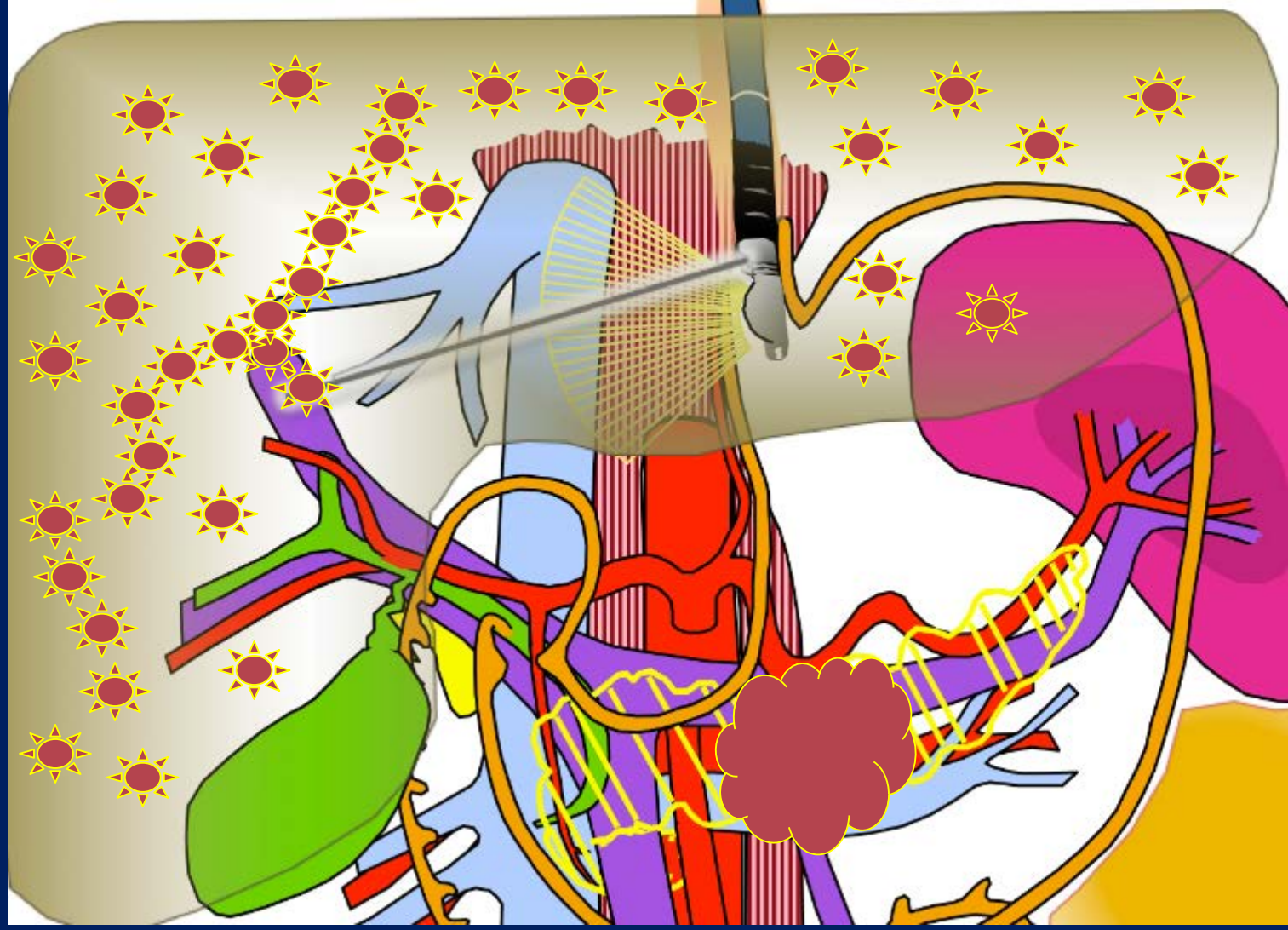
Hepatic Paclitaxel Levels (ng/mg)



MAYO CLINIC

In the future…





What's new in Interventional EUS?

Kenneth J. Chang, MD, FACG, FASGE
Director, H.H. Chao Comprehensive Digestive Disease Center
Professor and Chief, Gastroenterology
Endowed Chair, GI Endoscopic Oncology

UC Irvine Health