Quando e perché una biopsia epatica transgiugulare

Dott. Valerio Rosato

Dott. Francesco Maglione

Ore 9:30 Topic

- Quando e perché una biopsia epatica transgiugulare. F. Maglione – V. Rosato
- L'etica del trapianto epatico dopo il COVID. L. Craxì

Ore 10:30 III SESSIONE

Tavola Rotonda: NASH: il paradigma della gestione

Introduzione: M. Persico

Moderano: A. Aghemo - C. Coppola – A. Federico - F. Morisco

- Definizione del problema e priorità. G. Nardone
- Fattori di rischio NAFLD/NASH. A. Rocco
- La Diagnosi. L. Miele
- NAFLD e "complicanze" oncologiche. M. Masarone

Consultant's corner: F. Claar – L. Castellano - L. Fontanella - S. Scotto Di Santolo

Ore 13.00 conclusioni ed obiettivi del PDTA NASH. L.E. Adinolfi

Ore 14:00 Lunch

ONE-SECOND NEEDLE BIOPSY OF THE LIVER

GIORGIO MENGHINI, M.D.

From the Department of Medicine, University of Perugia, Perugia, Italy

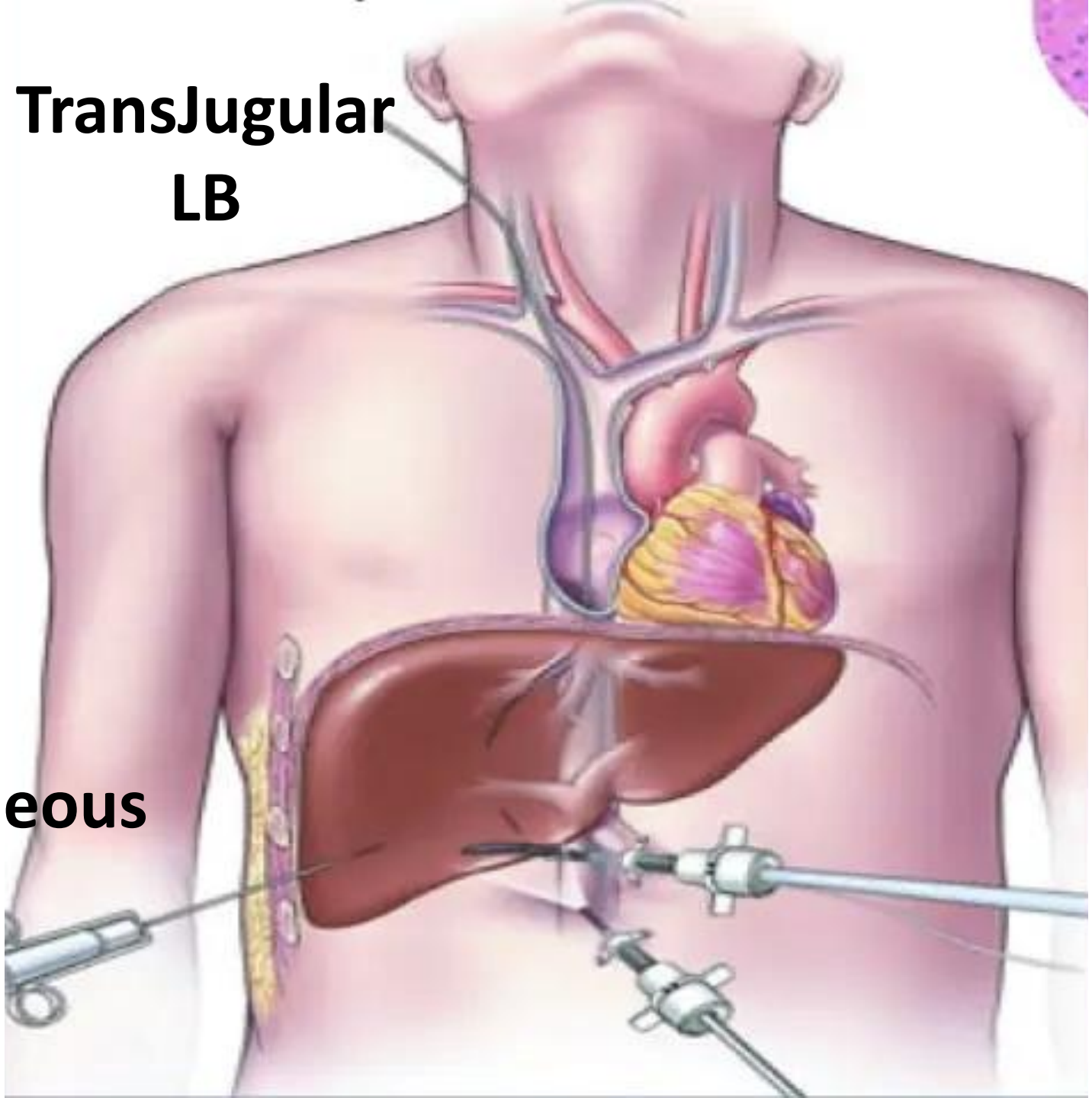
The most dangerous stage in performing a needle biopsy of the liver (at least as far as major accidents are concerned) begins when the tip of the instrument pierces Glisson's capsule and ends when the needle is withdrawn from the liver. This part of the operation corresponds to the phase of apnea, and its duration depends, obviously, on the skill of the operator and on the complexity of the movements required by the type of instrument chosen.

The average durations of the intrahepatic phase of needle biopsy of the liver in the common techniques are as follows: Vim-Silverman needle, about 15 minutes; Iversen needle, about 8 to 10 minutes; and Gillman needle, about 4 to 6 minutes.

Our technique allows us to reduce the duration of this phase to about one second; it also presents other advantages such as the smaller diameter of the cannula, the maneuverability of the instrument, and the ease of the movements to be made. Therefore we believe it is justifiable to publish the particulars concerning this method.

Submitted for publication November 21, 1957. Accepted for publication April 15, 1958.

TransJugular LB

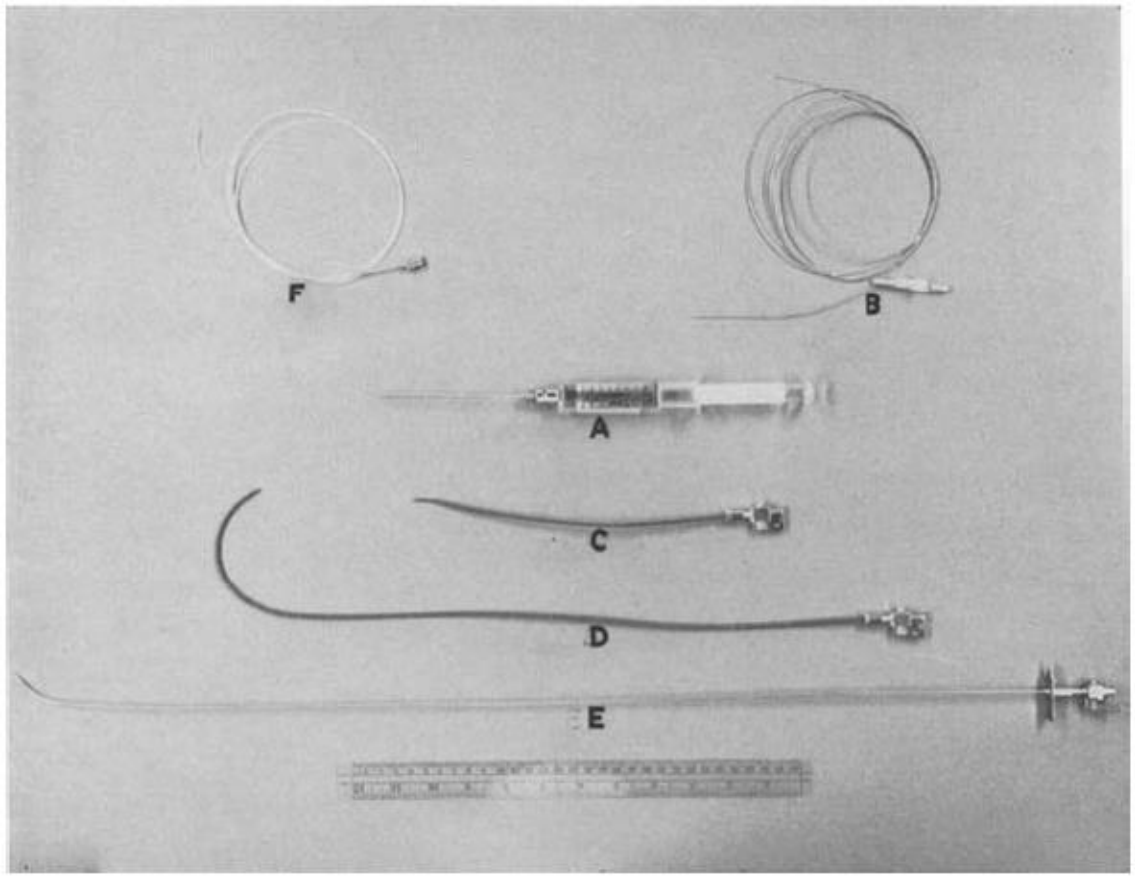


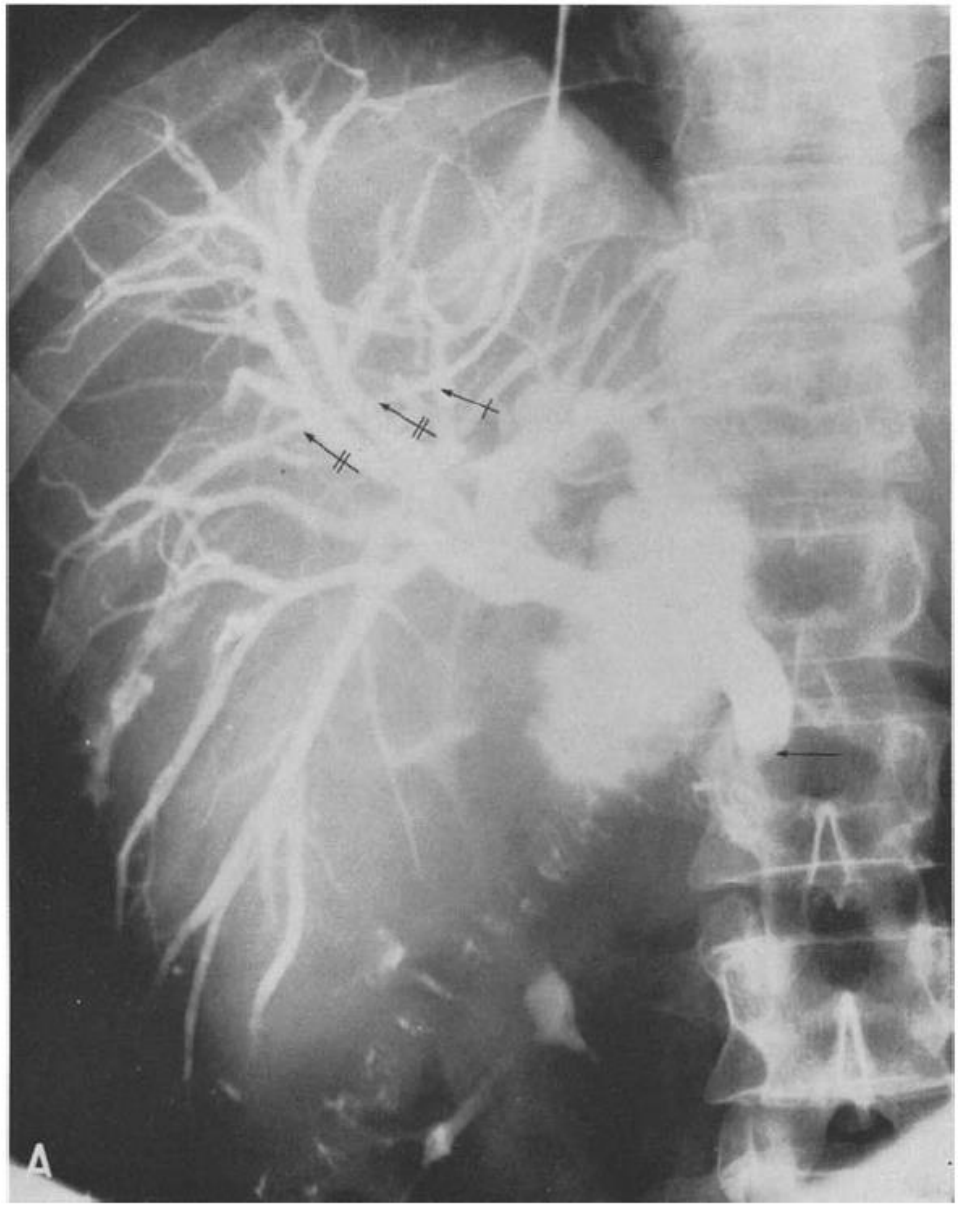
Percutaneous LB

Laparoscopic LB

Transjugular Percutaneous Cholangiography

WILLIAM HANAFEE, M.D., and MARVIN WEINER, M.D.





RADIOLOGY 88: 35–39, January 1967.

The New England
Journal of Medicine

Volume 289 AUGUST 2, 1973 Number 5

TRANSJUGULAR APPROACH TO LIVER BIOPSY AND TRANSHEPATIC CHOLANGIOGRAPHY

JOSEF RÖSCH, M.D., PAUL C. LAKIN, M.D., RUZA ANTONOVIC, M.D., AND CHARLES T. DOTTER, M.D.

Prima case series di TJLB con la descrizione di 44 biopsie.

Biopsia diagnostica nel 82 % dei casi e nessuna complicanza maggiore

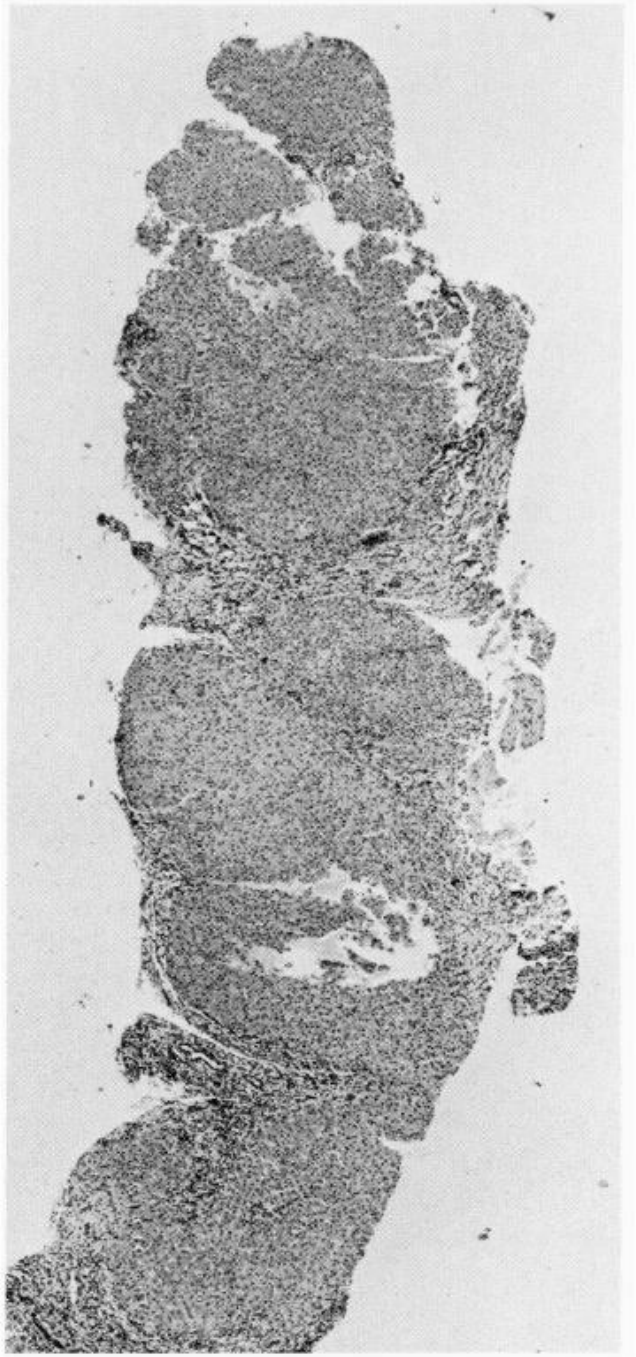
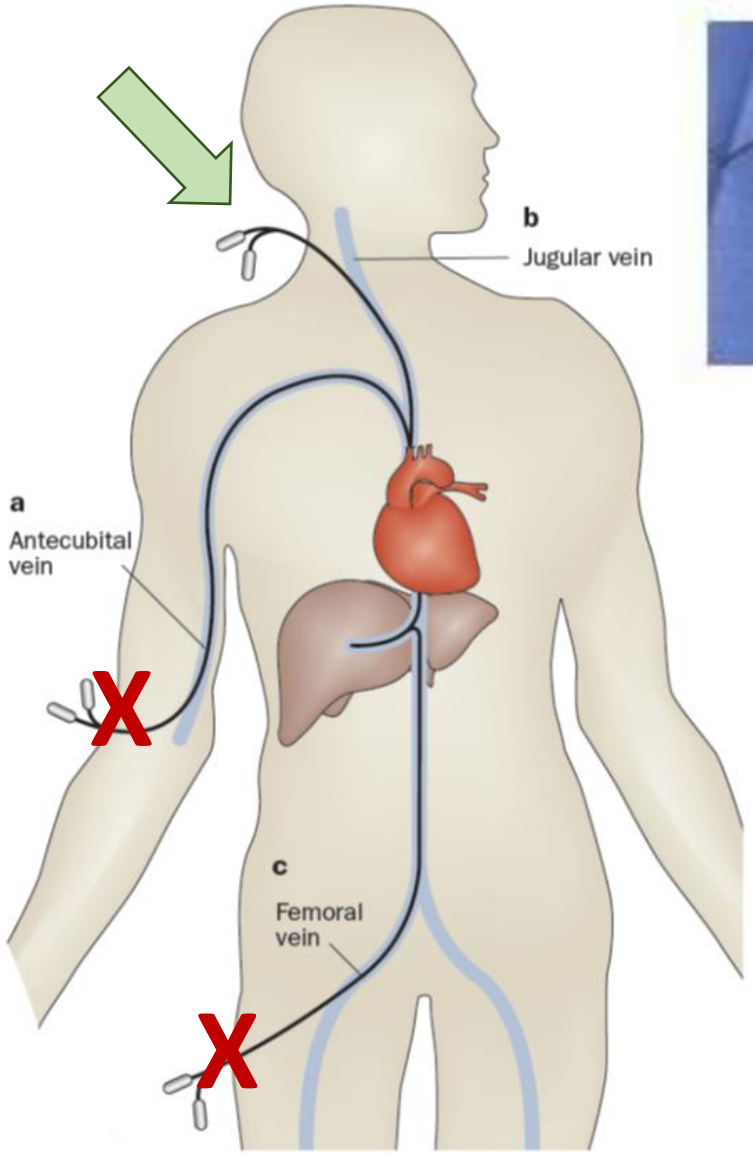
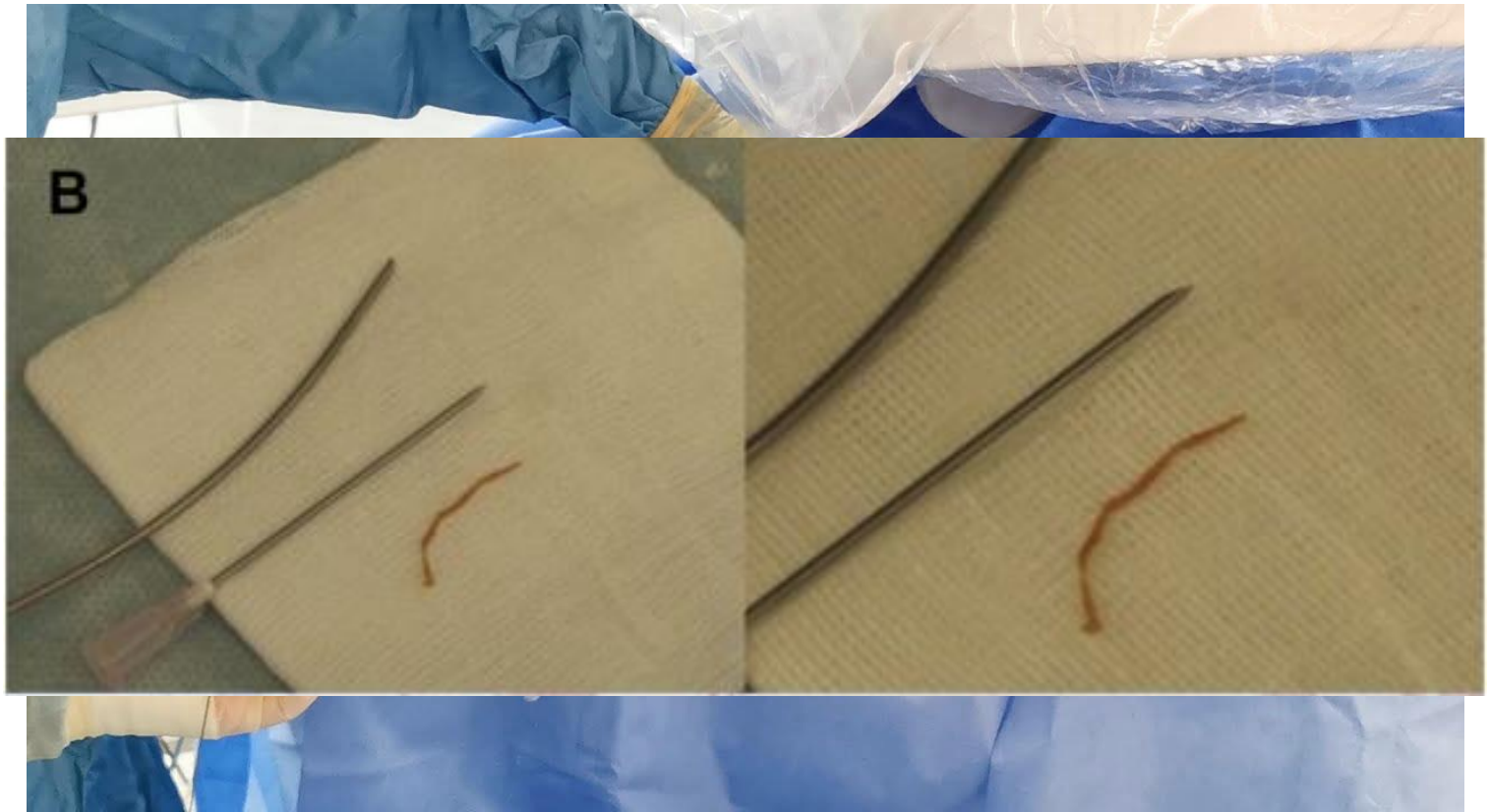
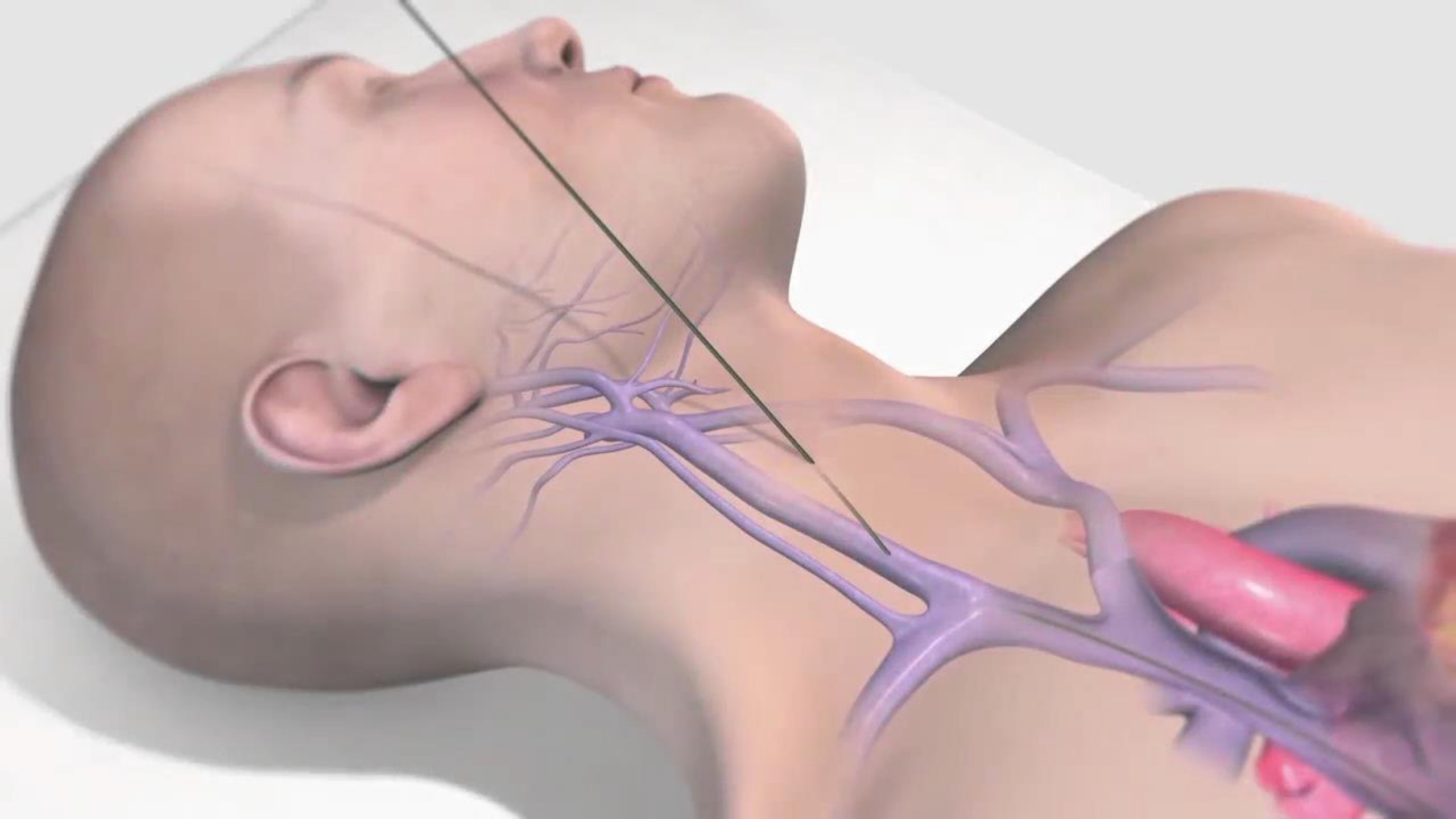


Figure 1. Transjugular Liver Biopsy in a 31-Year-Old Man with Cirrhosis.

Quando, perchè e come una
BIOPSIA EPATICA TRANSGIUGULARE (TJLB)

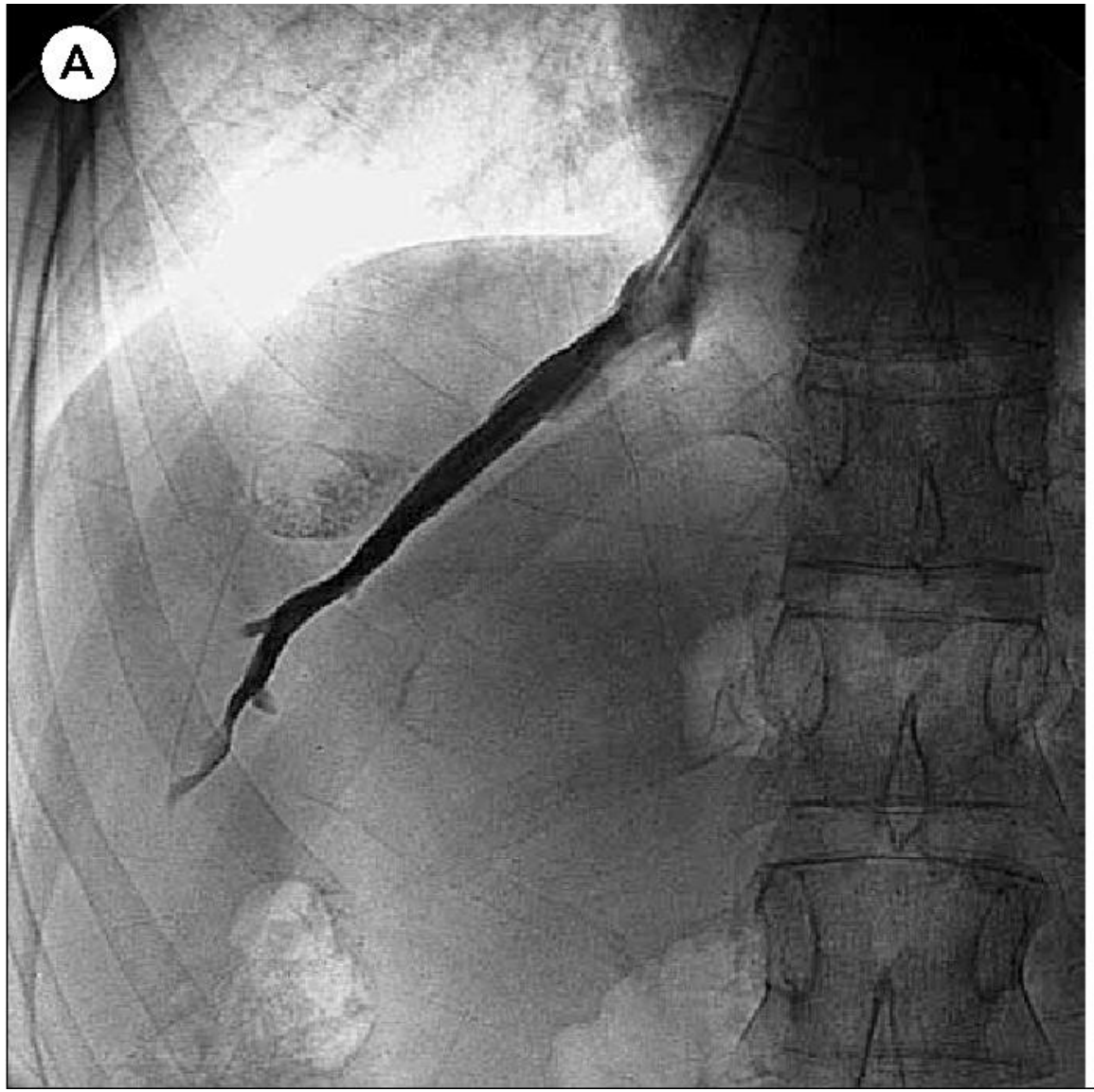


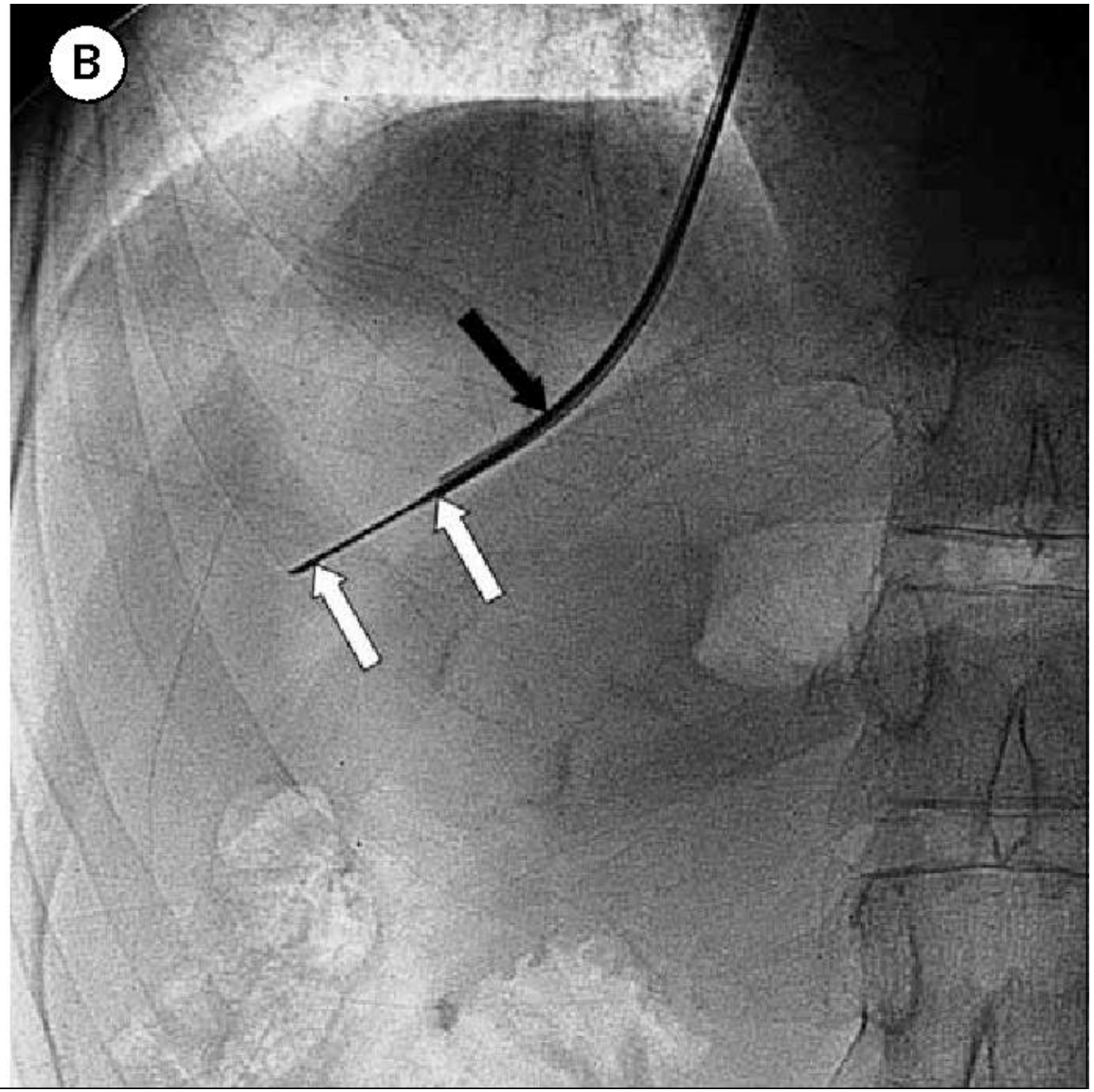




VENOGRAFIA

PUNTURA



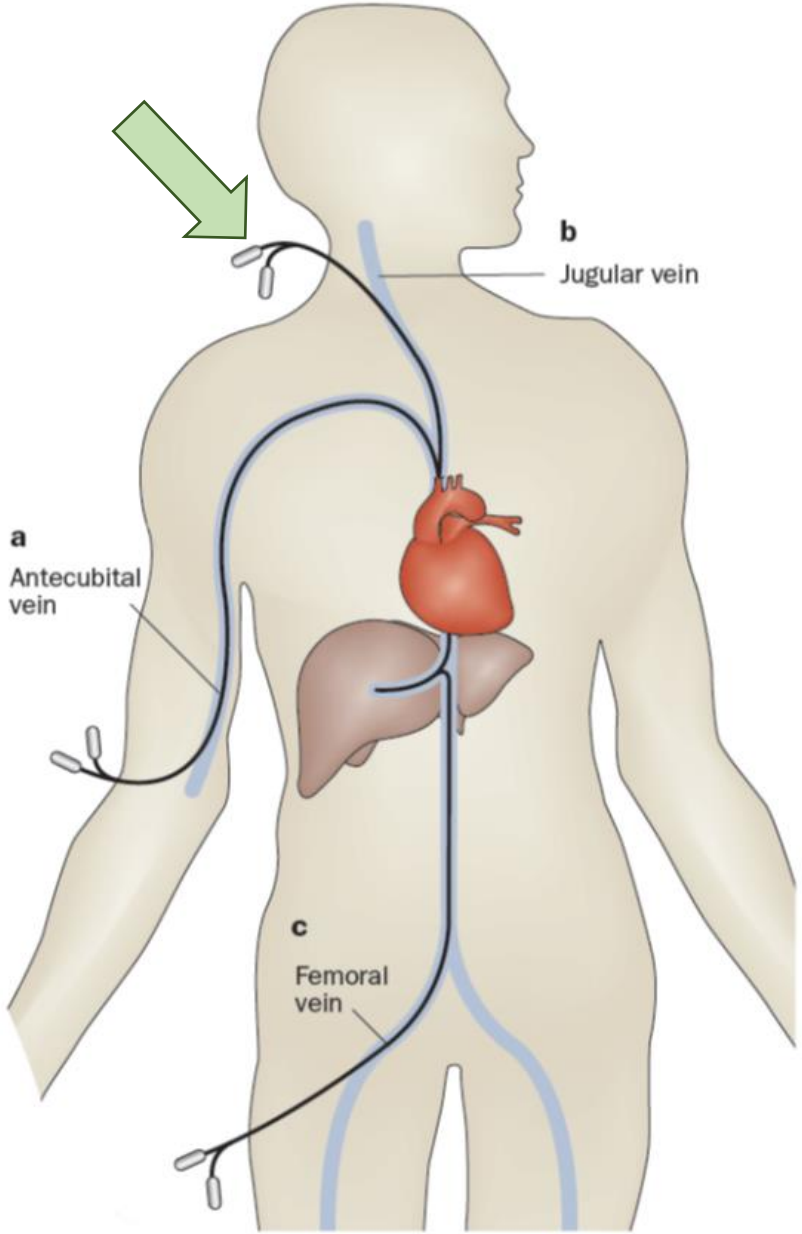


Perchè transgiugulare?

- Il principale vantaggio è <u>l'accesso tramite i vasi</u>

-> sanguinamento nel sistema vascolare - > <u>possibilità di esecuzione anche in caso di rischio elevato di sanguinamento (coagulopatia</u>)

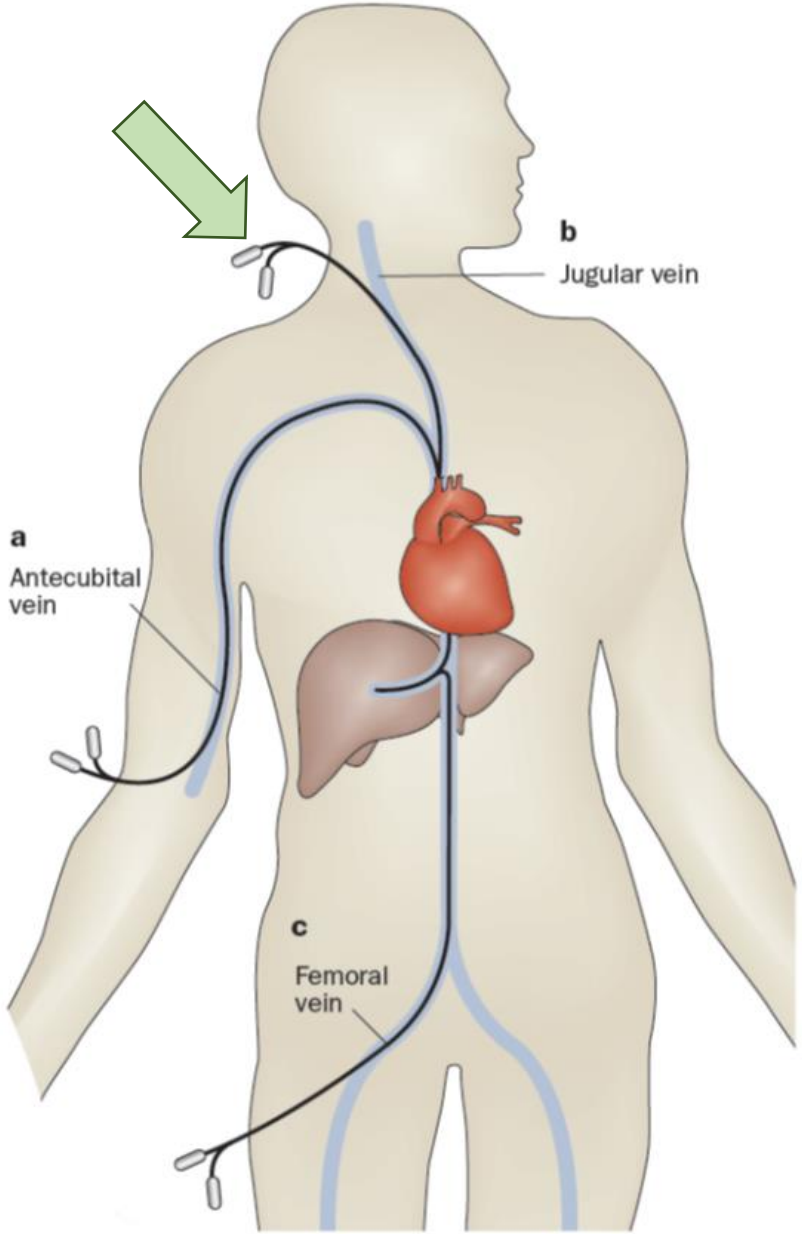
- Nessuna puntura attraverso la capsula epatica o le strutture circostanti.



Perchè transgiugulare?

- **Sicura**
- Basso tasso di complicanze(<1%), indipendemente dal numero di passaggi dell'ago

- Solo per l'epatopatie diffuse (no lesioni focali)
- In combinazione con HVPG (hepatic vein pressure gradient measurement)
  - Prognosi
  - Monitoraggio efficacia terapia medica



La TJLB è principalmente indicata quando la biopsia percutanea è controindicata.

Indicazioni alla biopsia transgiugulare

- Ascite
- Coagulopatia non correggibile

(PLT < 50000 – INR >1,5)

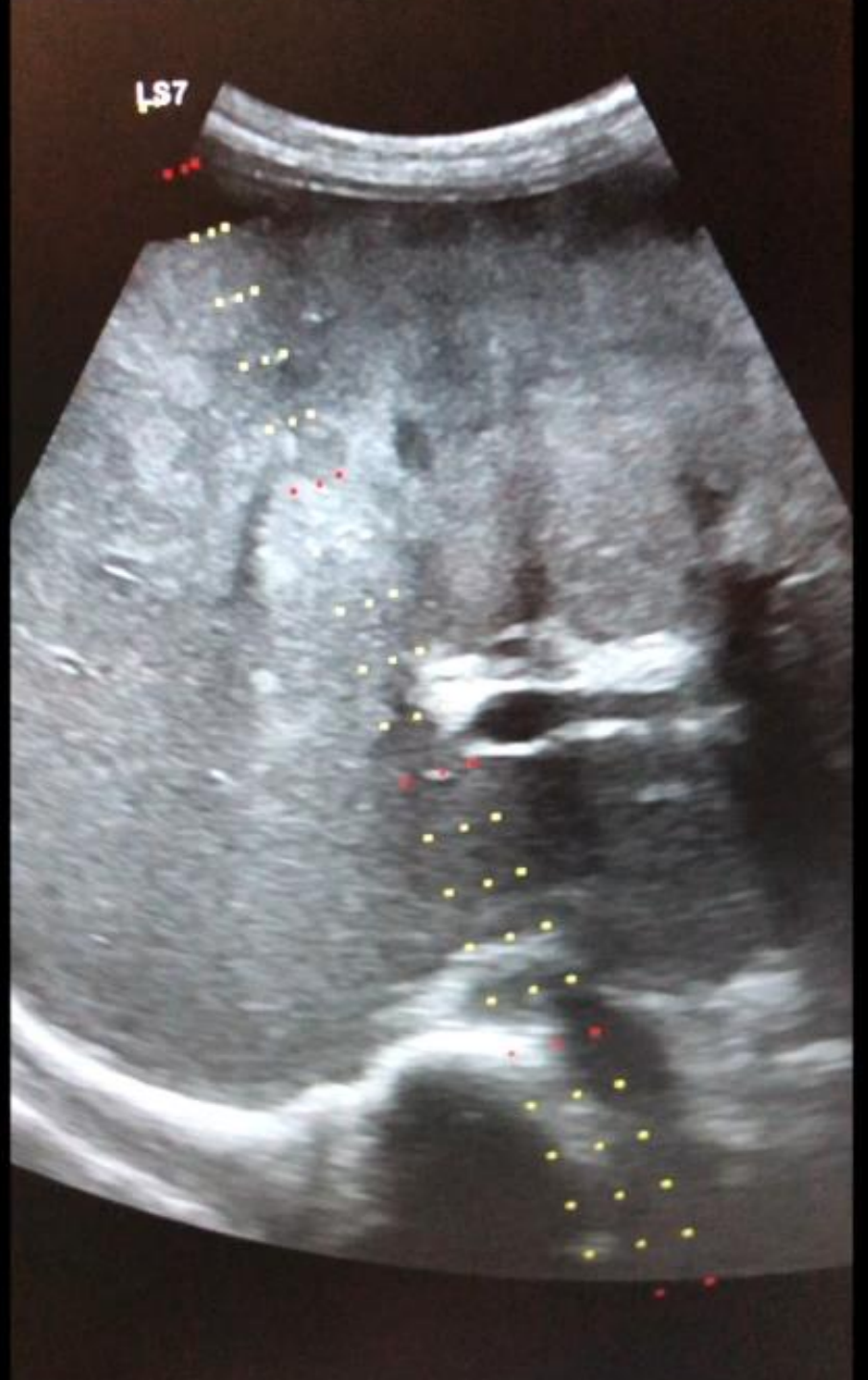
- Obesità grave
- Fallimento della biopsia percutanea

Controindicazioni alla biopsia percutanea

- Ascite
- Coagulopatia non correggibile

(PLT < 50000 – INR >1,5)

- Antiaggreganti nei 7-10 giorni precedenti
- Obesità grave
- Insufficienza epatica acuta
- Riceventi trapianto


LS7

Systematic review su 64 case series, 7649 TJLBs

Indications for transjugular liver biopsy reported in the present series

Indication	No. of patients	(%)
Coagulopathy[a]	1854	(35)
Ascites	695	(13)
Coagulopathy and/or ascites	2419	(46)
Coagulopathy and ascites	171	(3.2)
Ancillary procedures	184	(3.5)
Obesity	25	(0.5)
Failed PLB	29	(0.5)
Refused PLB	34	(0.6)

Abbreviations: PLB, percutaneous liver biopsy.

[a] Prothrombin time >3 s over control value and/or platelet count <60.000/cm^3 in 70% of studies.

Kalambokis et al JHEP 2007

LA COAGULOPATIA E' LA PRINCIPALE INDICAZIONE A UNA TJLB

Complications of transjugular liver biopsy in 4 paediatric series and in 60 adult series

Complications	Paediatric series ($n = 156$)	Adult series ($n = 7493$)	p
Total	27 (17%)	502 (6.7%)	<0.001
Major	3 (1.9%)	39 (0.5%)	0.02
Liver puncture-related	2 (1.3%)	19 (0.2%)	0.02
Non-liver puncture-related	1 (0.6%)	20 (0.3%)	NS
Minor	31 (20%)	456 (6%)	<0.001
Liver puncture-related	12 (7.7%)	228 (3%)	0.002
Non-liver puncture-related	19 (12%)	221 (2.9%)	<0.001
Deaths	1 (0.6%)	7 (0.09%)	0.04
Haemorrhage	0 (0%)	5 (0.07%)	NS
Arrhythmia	1 (0.6%)	2 (0.02%)	0.002

Abbreviations: NS, not significant.

Kalambokis et al JHEP 2007

COMPLICANZE MAGGIORI<1%, anche le emorragiche!

Transjugular Liver Biopsy: Safe Even in Patients With Severe Coagulopathies and Multiple Biopsies

Megan J. Sue, MD[1], Edward W. Lee, MD, PhD[1,2], Sammy Saab, MD, MPH, AGAF[3], Justin P. McWilliams, MD[1], Francisco Durazo, MD[3], Mohamed El-Kabany, MD[3], Fady Kaldas, MD[2], Ronald W. Busuttil, MD, PhD[2] and Stephen T. Kee, MD, FSIR[1]

1321 TJLB january 2009 to may 2017

Major and minor complication rates were 1% (13) and 9,5% (126)

No difference between pts with different plt counts or INR

Clinic and Trans Gastroenterol, 2019

Complication rate by platelet count	Complication rate at 3 days		Complication rate at 1 month	
Platelet count 0–50	9/124	7.30%	1/124	0.80%
Platelet count 51–100	33/310	10.60%	3/310	1.00%
Platelet count 101–200	51/547	9.30%	3/547	0.55%
Platelet count 201–300	28/235	11.90%	0/235	0.00%
Platelet count 300+	8/77	10.40%	3/77	6.50%
	$P > 0.05$		$P > 0.05$	

Complication rate by INR	Complication rate at 3 days		Complication rate at 1 month	
INR 0–1	17/237	7.10%	2/237	0.80%
INR 1.1–2.0	113/954	10.80%	10/954	1.00%
INR 2.1–3.0	7/43	16.30%	0/43	0.00%
INR 3.0	0/9	0.00%	0/9	0.00%
	$P > 0.05$		$P > 0.05$	

INR, international normalized ratio.

A 21-Year Experience With Major Hemorrhage After Percutaneous Liver Biopsy

DOUGLAS B. McGILL, JORGE RAKELA, ALAN R. ZINSMEISTER, and BEVERLY J. OTT
Division of Gastroenterology, Department of Medicine and Section of Biostatistics, Mayo Clinic and Mayo Foundation, Rochester, Minnesota

GASTROENTEROLOGY 1990;99:1396–1400

TJLB offers the feasibility of multiple passes, which increase the length and the diagnostic value of specimens, particulary if **>3 passes using Tru-Cut needles** are employed, without increasing complications.

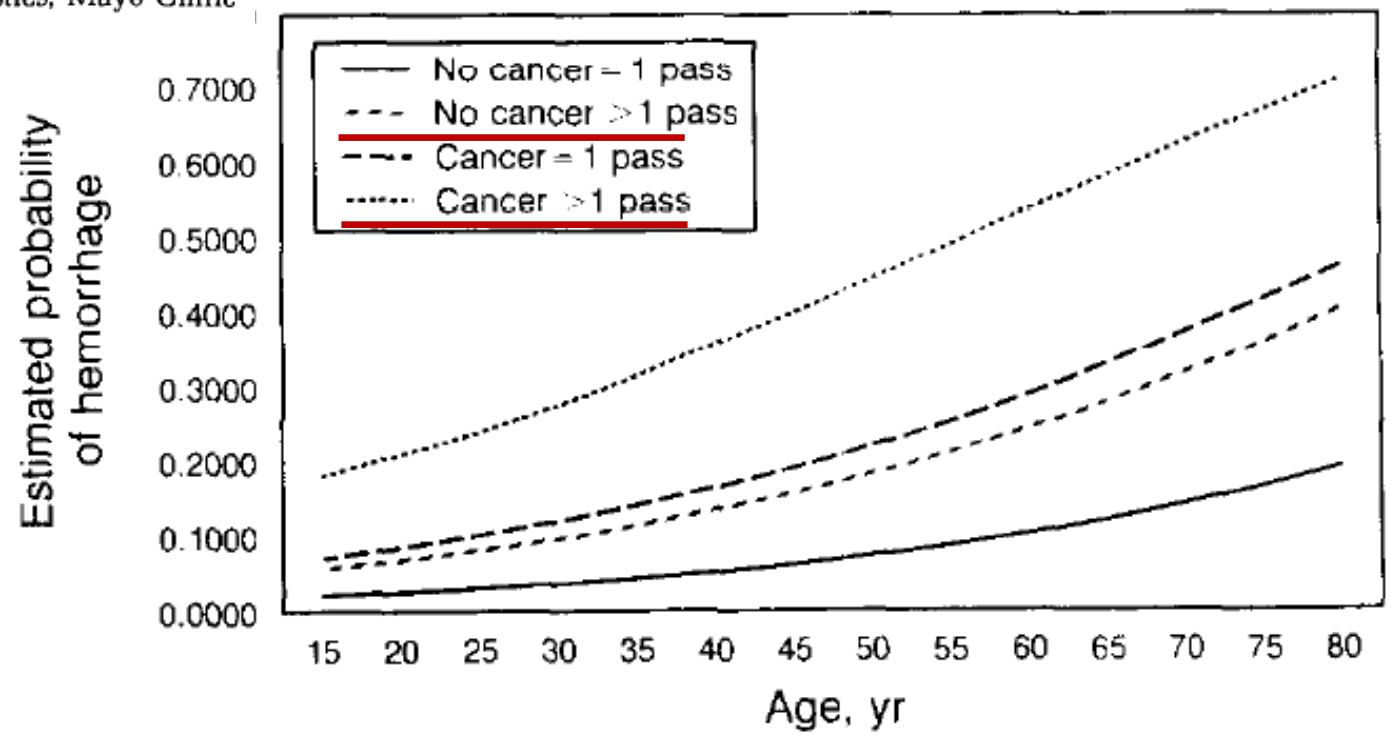


Figure 3. Relationship between the chance of a complication and sex, age, presence of malignancy, and number of passes during liver biopsy: females.

Safety of percutaneous versus tansjugular liver biopsy.

Restrospective review of on 1467 patients from the years 2009-2013. **(PLB 978, TJLB 489)**

TJLB had a lower risk of hematoma (0,2 % vs 1,2%)

No difference in readmission or mortality rates.

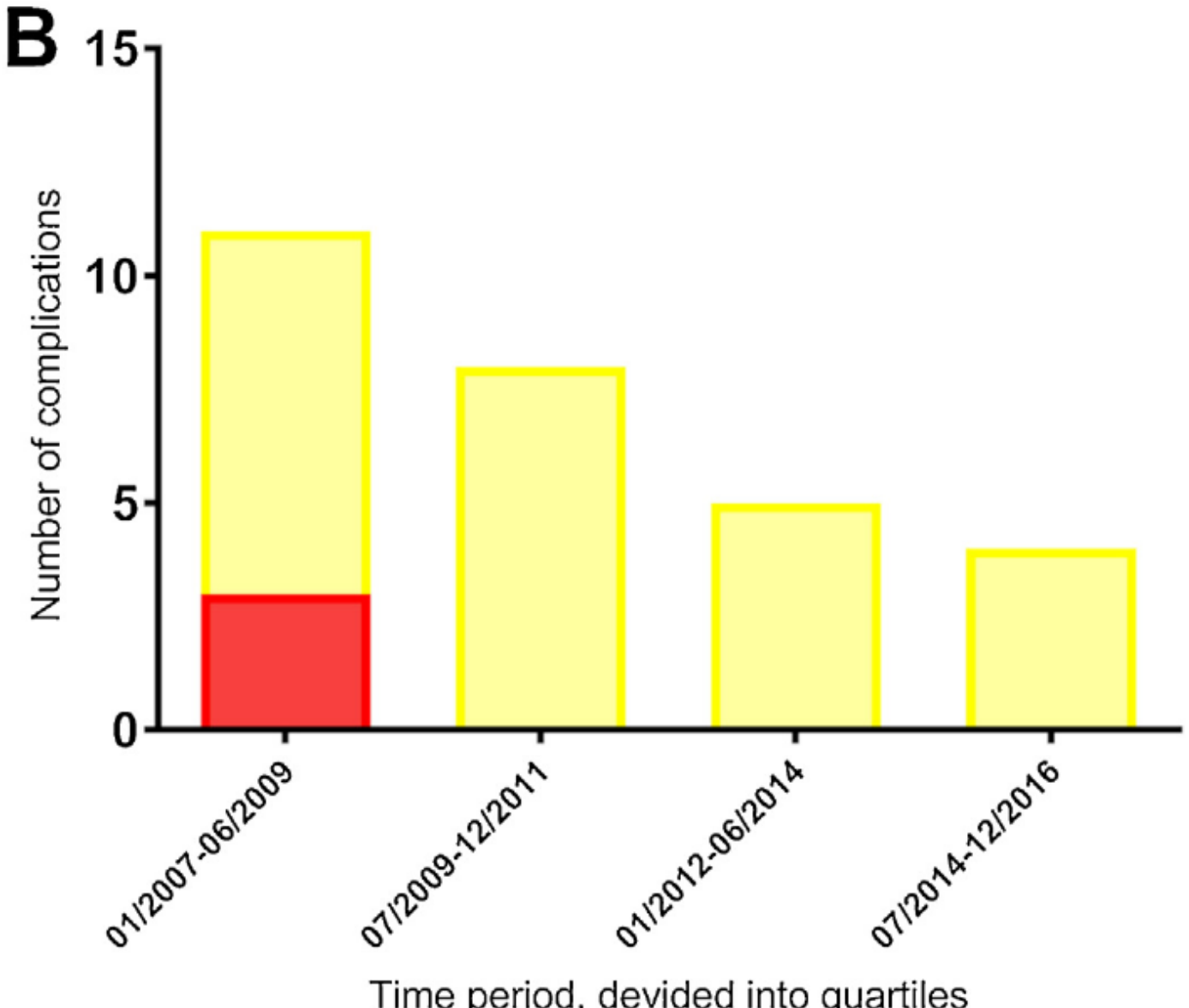
L.D. Lavina et al, Eur J of Radiology 2020

5-day complication, 7-day readmission, and 7-day mortality rates of patients within each cohort.

	PCLB	TJLB	P-Value
Cardiac	0.00 %	0.40 %	0.045
PVD	0.00 %	0.00 %	–
Respiratory	0.10 %	0.00 %	0.479
Digestive	0.70 %	0.00 %	0.061
Vascular	0.10 %	0.20 %	0.617
Hematoma	1.20 %	0.20 %	0.049
Puncture	0.10 %	0.00 %	0.479
Infection	0.50 %	0.20 %	0.386
Fistula	0.00 %	0.00 %	–
Fever or Chills	0.70 %	0.40 %	0.478
Pneumothorax or Air Leak	0.00 %	0.00 %	–
Acute post-operative pain, abdominal pain or tenderness	0.80 %	0.40 %	0.369
Hemoperitoneum	0.00 %	0.00 %	–
Hemobilia	2.40 %	2.90 %	0.556
Any Complication	6.30 %	4.50 %	0.153
	PCLB	TJLB	P-Value
Any Readmission Within 7 Days	1.30 %	1.40 %	0.874
Died within 7 days	4.60 %	4.50 %	0.930

Footnote: PVD – peripheral vascular disease, ICD9 code includes conditions such as deep vein thrombosis.

Transjugular aspiration liver biopsy **performed by hepatologists** trained in HVPG measurements is safe and provides important diagnostic information



445 TJLB dal 2007 al 2016

28 complicanze (6,3%)

Eziologia indeterminata pre-biopsia: 151 pazienti

Eziologia possibile dopo biopsia: 125 (83%)

Stift et al DLD 2019

Accuratezza diagnostica della TJLB

6-8 complete portal tracts should be present for diagnosis, most histopathologists accepting six portal tracts.

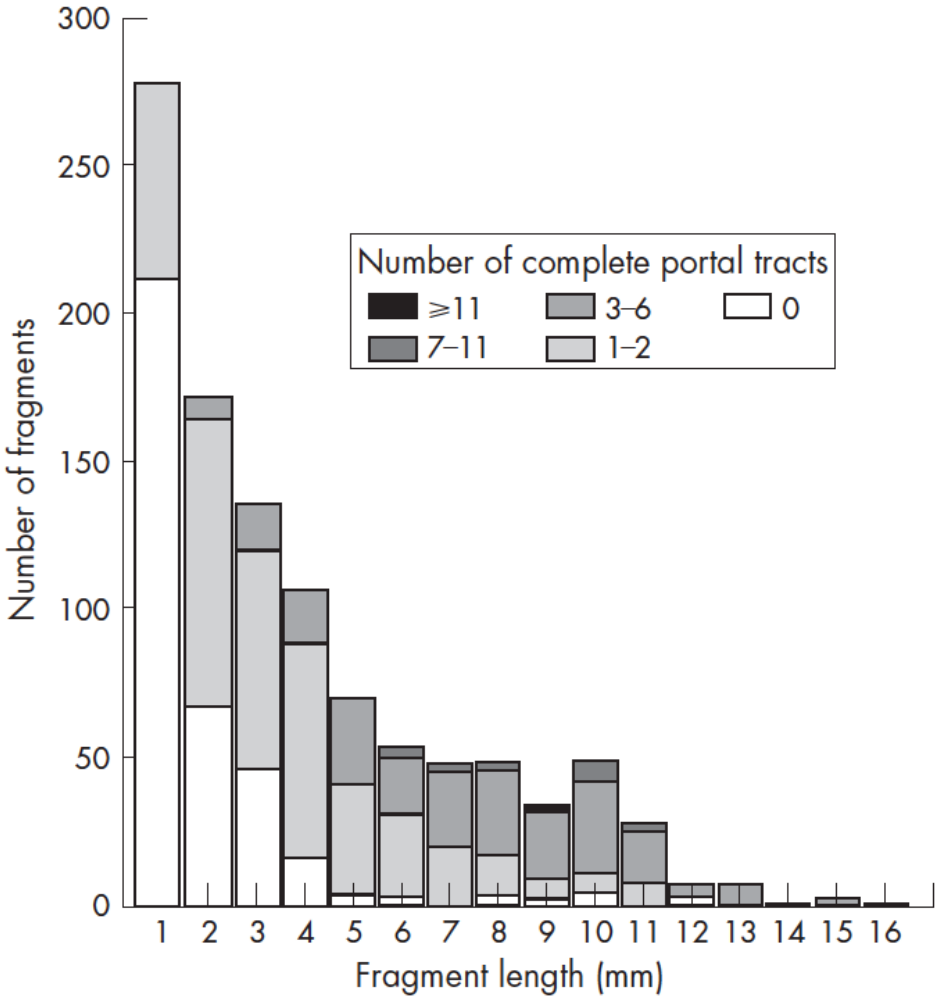
However, with the increasing need to assess **fibrosis** in chronic hepatitis C and non-alcoholic fatty liver disease, specimens of **20–25 mm** length or **>11 complete portal tracts** have been considered to be necessary to reliably assess grading and staging, and to reduce sampling errors.

E Cholongitas et al. GUT 2006

Transjugular liver biopsy: how good is it for accurate histological interpretation?

E Cholongitas, A Quaglia, D Samonakis, M Senzolo, C Triantos, D Patch, G Leandro, A P Dhillon, A K Burroughs

Gut 2006;**55**:1789–1794. doi: 10.1136/gut.2005.090415

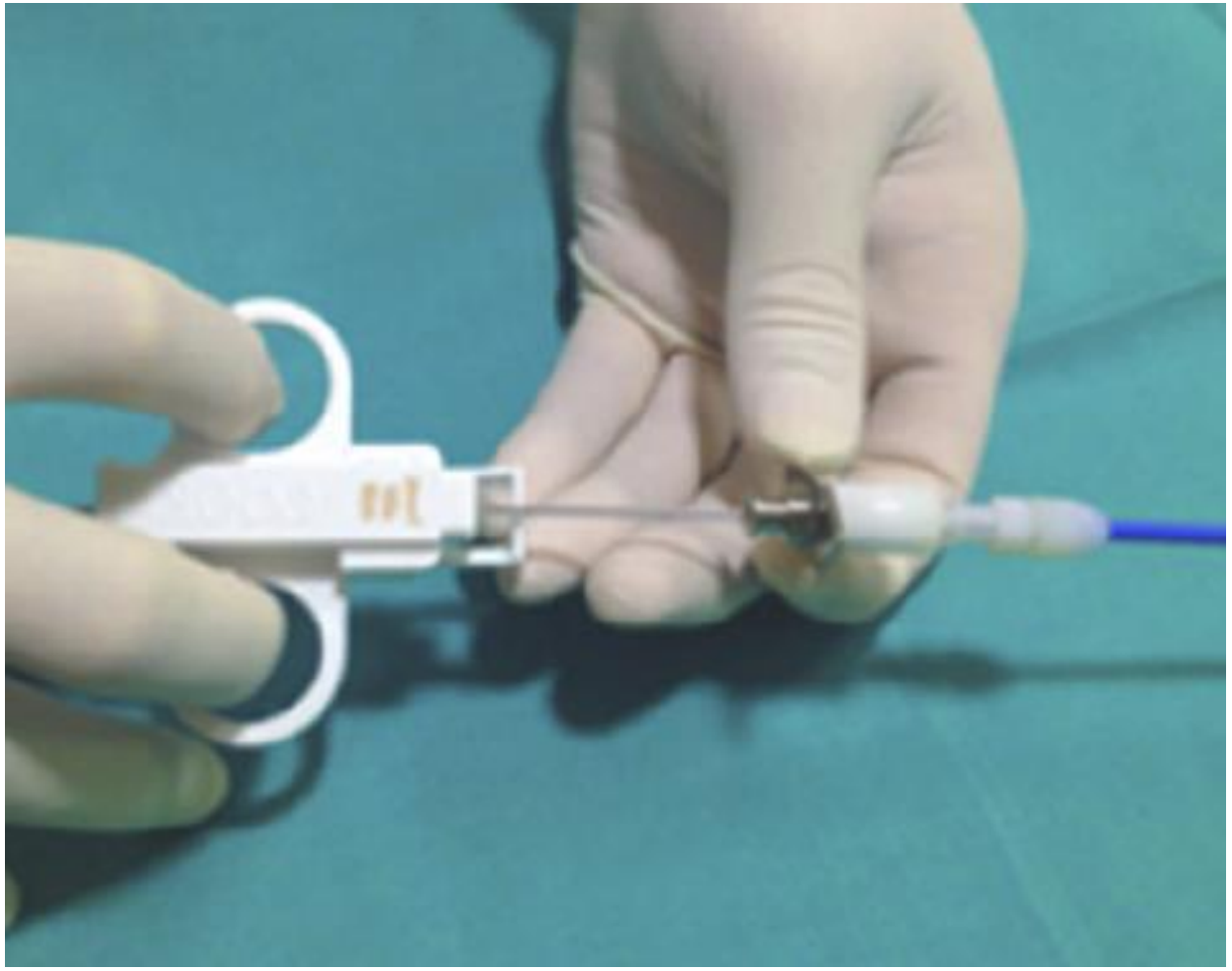


326 consecutive TJLB, always using 3 passes (19G Tru-cut) and 40 consecutive PLB specimens (15G Menghini).

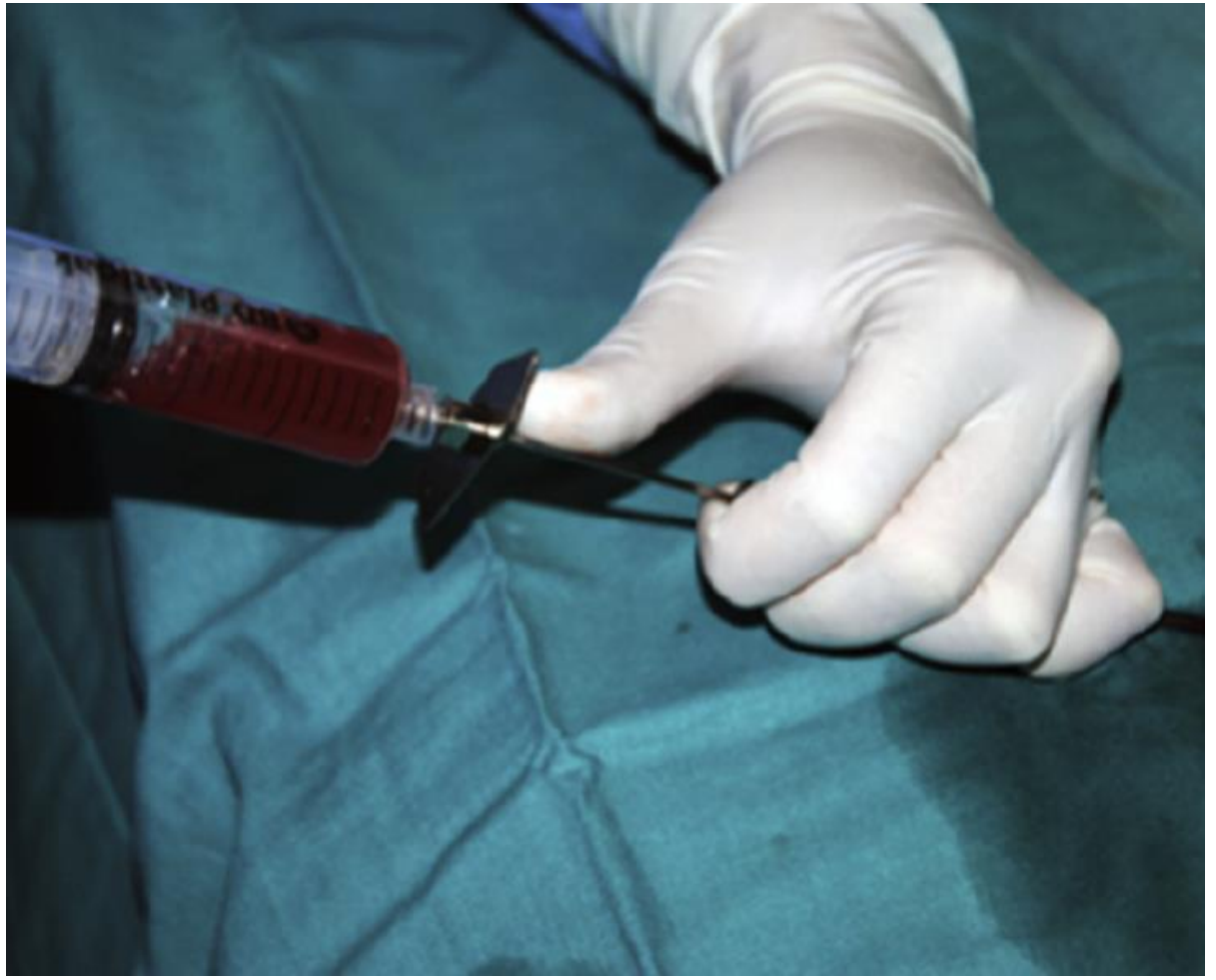
60 % of TJLB specimens were **>28mm long had >11 complete portal tracts.**

No difference in complete portal tracts number or biopsy lenght was found between PLB and TJLB

Core-biopsy
Tru-Cut



Aspiration
Menghini



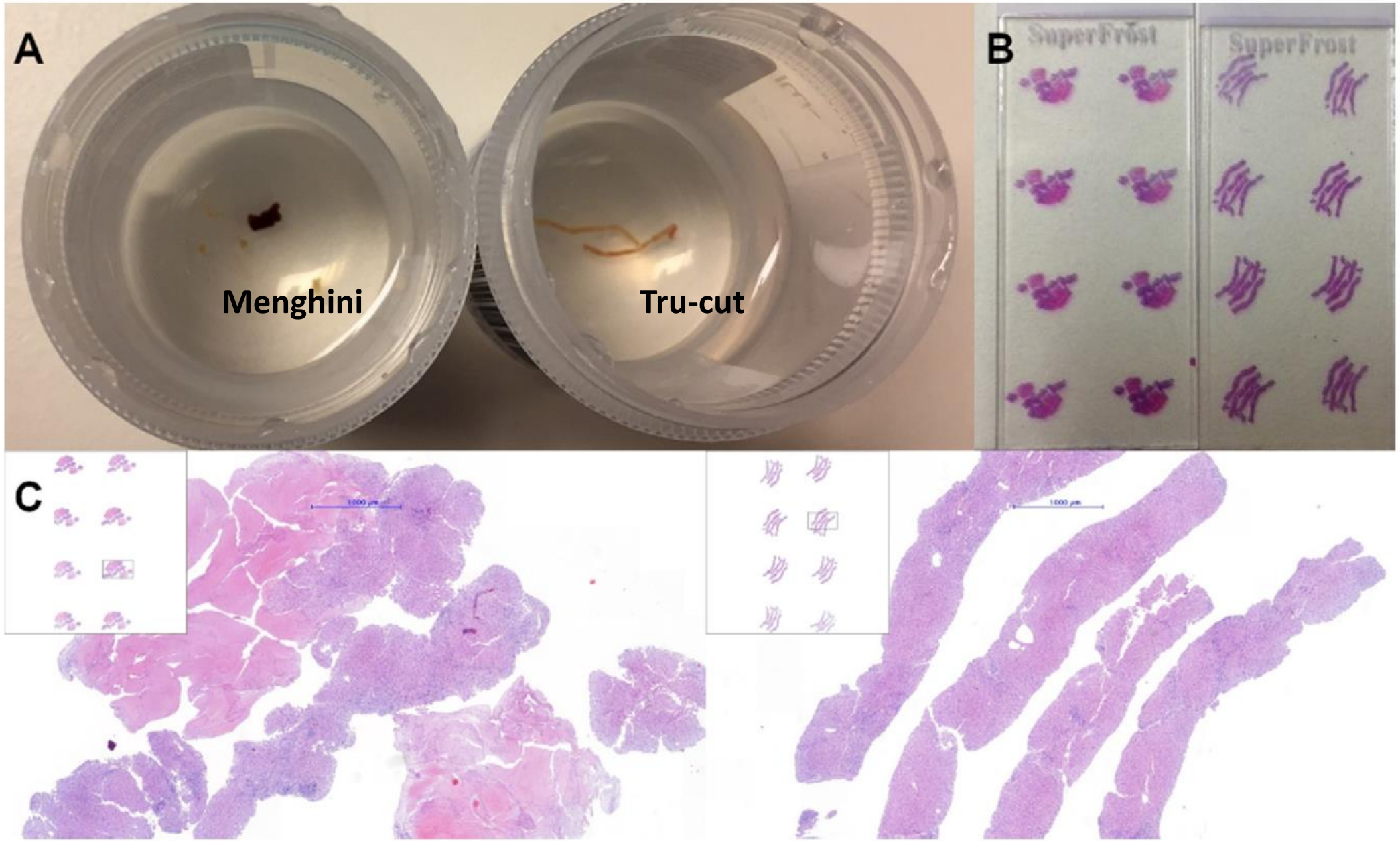


Fig. 1. Representative pictures of liver biopsy specimens obtained with the transjugular aspiration biopsy needle (left) and with the transjugular core-biopsy needle (right) in a patient with a hepatic venous pressure gradient (HVPG) of 19mmHg and a liver stiffness measurement (LSM) of 54.4kPa: **(A)** Overview, **(B)** macroscopic view, and **(C)** microscopic view (2-fold magnification).

Tru-Cut vs Menghini

Quality characteristics in Menghini and Tru-Cut needle series of transjugular liver biopsy

	Menghini needle	Tru-Cut needle	*p*
Quality characteristics			
Median length (mm)	9.5 (7–1)	14.5 (10–2.5)	0.008
Median CPTs number†		7.4 (4–11)	
Specimens adequate for histological diagnosis‡	729/782 (93.2%)	1426/1464 (97.4%)	<0.001
Median number of passes			
In series reporting length	2.6 (2–3.3)	2.7 (1–6)	NS
In series reporting CPTs†		2.3 (1.5–3)	
In series reporting histological diagnosis	2.6 (1–3.3)	2.8 (1–6)	NS

Only series reporting both mean number of passes and each characteristic were evaluated.
Abbreviations: CPTs, complete portal tracts; NS, not significant.
† Two series with Menghini needle: 2.7 and 7 CPTs using 3.3 and 2 passes, respectively.

Systematic review su 64 case series, 7649 TJLBs

Kalambokis et al JHEP 2007

Comparison of the diagnostic quality of aspiration and core-biopsy needles for transjugular liver biopsy

Judith Stift[a,1], Georg Semmler[b,c,*], Katharina Wöran[a], Benedikt Simbrunner[b,c], Bernhard Scheiner[b,c], Philipp Schwabl[b,c], Rafael Paternostro[b,c], Matthias Pinter[b,c], Albert Friedrich Stättermayer[b,c], Tobias Meischl[b,c], Andrea Beer[a], Michael Trauner[b], Mattias Mandorfer[b,c], Thomas Reiberger[b,c,*]

In patients with **HVPG ≥10mmHg,** we recommend to performed TJLB using **core-biopsy needles**, while the **aspiration needle** provides high quality liver biopsy specimens in patients with **HVPG <10mmHg**.

Comparison of aspiration (A) and core-biopsy (C) specimens in terms of quantitative and qualitative criteria among HVPG-stages.

	HVPG <10mmHg (n=45)			HVPG 10-20mmHg (n=39)			HVPG >20mmHg (n=31)		
	A (n=35)	C (n=10)	*P* value	A (n=27)	C (n=12)	*P* value	A (n=18)	C (n=13)	*P* value
Number of PT	9 (6-16)	6 (4-12)	0.262	9 (4-13)	11 (5-20)	0.233	6 (1-12)	8 (7-21)	0.170
≥6 PT	27 (77.1%)	5 (50.0%)	0.124	19 (70.0%)	9 (75.0%)	1.000	9 (50.0%)	11 (84.6%)	0.066
≥11 PT	17 (48.6%)	3 (30.0%)	0.473	8 (29.6%)	5 (50.0%)	0.287	5 (27.8%)	5 (38.5%)	0.701
Sample length, mm	21 (13-30)	12 (9-16)	**0.007**	13 (8-20)	12 (9-21)	0.964	9 (6-14)	13 (11-17)	0.106
≥20mm	19 (54.3%)	1 (10.0%)	**0.027**	7 (25.9%)	3 (25.0%)	1.000	4 (23.5%)	2 (15.4%)	0.672
Fragmentation									
No	9 (25.7%)	4 (40.0%)	0.515	6 (22.2%)	7 (58.3%)	**0.012**	4 (22.2%)	8 (66.7%)	**0.013**
Intermediate	17 (48.6%)	5 (50.0%)		10 (37.0%)	5 (41.7%)		7 (38.9%)	4 (33.3%)	
Complete	9 (25.7%)	1 (10.0%)		11 (40.7%)	0 (0.0%)		7 (38.9%)	0 (0.0%) [1]	
Number of fragments	6 (5-10)	4 (2-6)	**0.021**	5 (4-8)	5 (3-6)	0.221	5 (3-7)	4 (2-6)	0.180
Assignment of etiology									
Not possible	3 (8.3%)	0 (0.0%)	1.000	2 (7.4%)	1 (8.3%)	0.186	2 (11.1%)	3 (23.1%)	0.142
Limited	9 (25.7%)	3 (30.0%)		12 (44.4%)	2 (16.7%)		5 (27.8%)	0 (0.0%)	
Good	23 (65.7%)	7 (70.0%)		13 (48.1%)	9 (75.0%)		11 (61.1%)	10 (76.9%)	
Assessment of fibrosis									
Not possible	6 (17.1%)	1 (10.0%)	1.000	9 (33.3%)	0 (0.0%)	0.061	5 (27.8%)	3 (23.1%)	1.000
Limited	5 (14.3%)	1 (10.0%)		4 (14.8%)	2 (16.7%)		1 (5.6%)	1 (7.7%)	
Good	24 (68.6%)	8 (80.0%)		14 (51.9%)	10 (83.0%)		12 (66.7%)	9 (69.2%)	
Assessment of Laennec stage in cirrhosis (F4) [2]									
Not possible	5 (55.6%	1 (16.7%)	0.287	2 (14.3%)	0 (0.0%)	0.502	4 (30.8%)	1 (10.0%)	0.339
Possible	4 (44.4%)	5 (83.3%)		12 (85.7%)	9 (100.0%)		9 (69.2%)	9 (90.0%)	

DLD 2020

Editorial

Transjugular liver biopsy: The Tru-cut needle might be better for stiffer livers

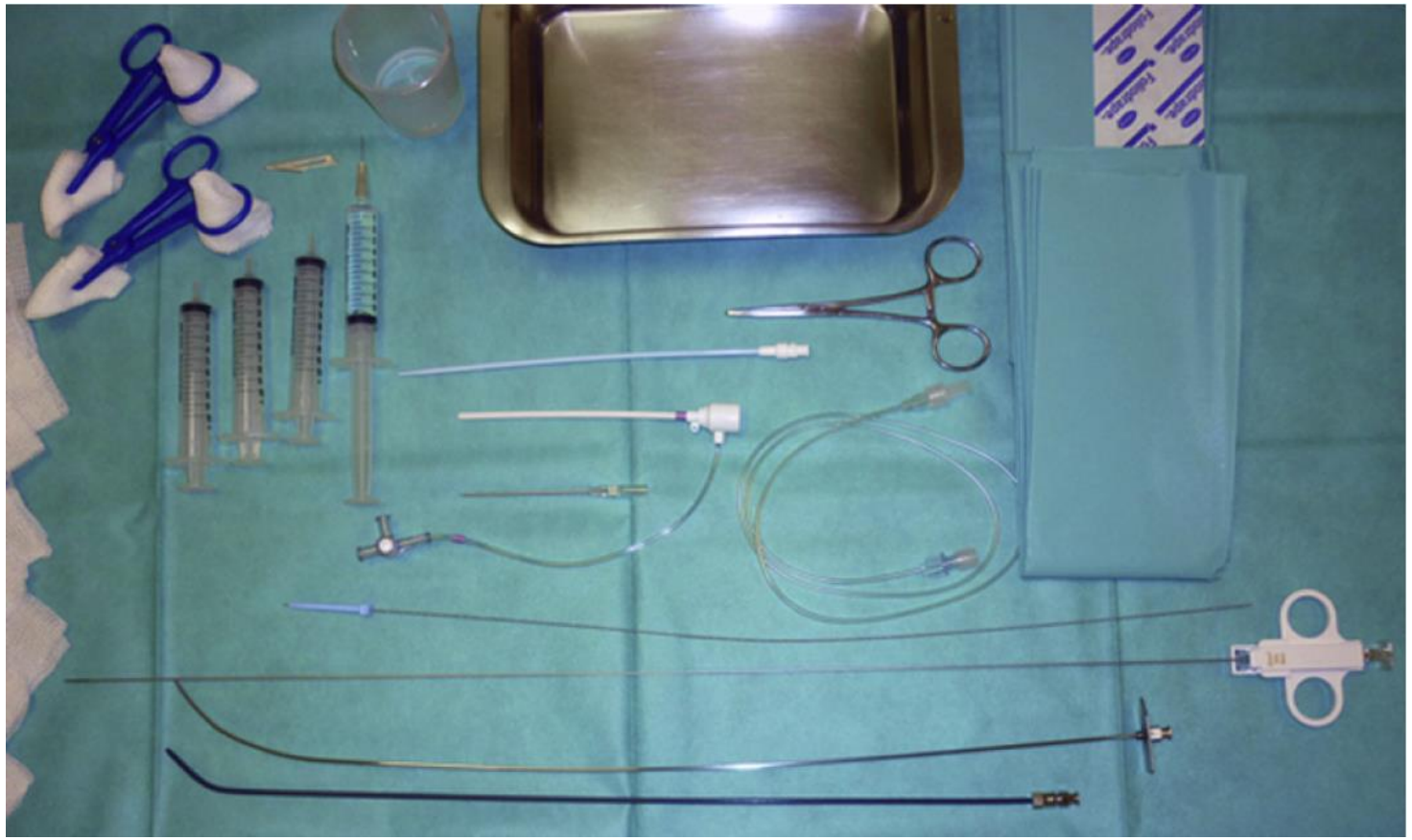
mens. HVPG is the measure of portal hypertension and one of the strongest predictors of clinical decompensation in patients with compensated cirrhosis [7]. Stift et al. [6] show that in patients with clinically significant portal hypertension (CSPH), defined as HVPG of at least 10 mmHg, in whom fibrous septa are mostly thick [8,9], the Tru-cut needle performs better, in terms of a lower proportion of fragmented liver samples (more than 6 out of 10 not fragmented with Tru-cut needle *vs.* 2 out of 10 not fragmented specimens with aspiration needle; $p = 0.01$). By contrast, in patients with mild or absent portal hypertension (HVPG <10 mmHg), in whom fibrous septa are more frequently thin [8,9], the aspiration needle performs better, in terms of greater sample length and proportion of liver specimen equal or longer than 2 cm (more than 5 out of 10 liver samples ≥2 cm obtained with aspiration needle *vs.* 1 out of 10 obtained with tru-cut needle; $p = 0.02$). Furthermore, LS measured by vibration-controlled transient elastography (VCTE) is an emerging tool that could guide the decision on which needle type is best for TJLB: aspiration needles perform better for TJLB when the liver tissue is softer (LS <20 kPa) and Tru-cut needles are superior in terms of diagnostic quality in the presence of stiffer livers (LS>40 kPa). This finding is not unexpected since LS is a predictor

10 obtained with tru-cut needle; $p = 0.02$). Furthermore, LS measured by vibration-controlled transient elastography (VCTE) is an emerging tool that could guide the decision on which needle type is best for TJLB: aspiration needles perform better for TJLB when the liver tissue is softer (LS <20 kPa) and Tru-cut needles are superior in terms of diagnostic quality in the presence of stiffer livers (LS>40 kPa). This finding is not unexpected since LS is a predictor

C. Rigamonti et al. Dig Liver Dis. 2020 Dec;52(12):1381-1382

Preoccupazioni circa la biopsia transjugulare

- Tecnica più impegnativa
- Richiede tempo
- Non effettuabile al letto del paziente
- **Costi**
- Radiazioni
- **Contrasto**



La domanda non è se percutanea o transgiugulare, ma perché dobbiamo effettuare una biopsia.

The term “best standard” is more appropiate than “gold standard”

Bedossa P & Carrat F. J hepatology 2009; 50 1-3

However, liver biopsy is not a perfect reference standard and it has been shown that an AUROC >0.90 is not achievable even for a perfect biomarker.

Limitations

- **Sampling error**
  - major limitation
  - small portion of liver

  → 2-3 cm – 10 portal tracts

- **Intra/inter-observer variation**

  → Scoring system
  → Experienced pathologist

- **Invasive procedure**

pain	20%
major complication	0,5%
mortality	0,03%

→ US guided biopsy

Journal of Hepatology 50 (2009) 36–41

TJLB e HVPG

TJLB permette inoltre la misurazione del gradiente pressorio venoso epatico (HVPG), che ha un importante valore prognostico per la sopravvivenza e la risposta alla terapia farmacologica dell'ipertensione portale.

Indications for transjugular liver biopsy[a]
Major
Coagulation disorders[b]
Ascites[c]
Need for concurrent procedures[d]
Minor
Massive obesity
Small cirrhotic liver
Suspected vascular tumor or peliosis hepatic

Liver biopsy? Long life to the transjugular route

Enric Reverter

Liver and Digestive ICU, Liver Unit, Hospital Clínic of Barcelona, Spain

The only caveats of TJLB is the higher cost and longer duration of the procedure, which is operator-dependent and, when in experienced hands, is not much longer than a percutaneous biopsy. These look minor, since transjugular access allows not only the performance of a biopsy but also the measurement of HVPG, cardio-pulmonary pressures (and cardiac output with a Swan-Ganz catheter) and even the placement of a TIPS [5]. It is my view that all for variceal bleeding prophylaxis and of decompensation [5–7]. The transjugular approach is a highly dynamic process where the operator can decide to further study cardio-pulmonary pressures after observing, for example, elevated venous pressures. Hyperdynamic heart failure or portopulmonary hypertension are not unusual conditions in advanced cirrhosis which can be finely diagnosed by a transjugular study [8]. Even in non-liver diseases, for example hematologic patients, HVPG can add diagnostic information to specific entities like sinusoidal obstruction syndrome [9].

DLD, 2019

Porto-sinusoidal vascular disease: proposal and description of a novel entity

Andrea De Gottardi, Pierre-Emmanuel Rautou, Jeoffrey Schouten, Laura Rubbia-Brandt, Frank Leebeek, Jonel Trebicka, Sarwa Darwish Murad, Valérie Vilgrain, Virginia Hernandez-Gea, Filipe Nery, Aurélie Plessier, Annalisa Berzigotti, Paulette Bioulac-Sage, Massimo Primignani, David Semela, Laure Elkrief, Pierre Bedossa, Dominique Valla, Juan Carlos Garcia-Pagan*, on behalf of the VALDIG group*

Definition of PSVD

Liver biopsy ≥20 mm without cirrhosis	+	1 sign specific for portal hypertension or 1 histological lesion specific for PSVD

OR

Liver biopsy ≥20 mm without cirrhosis	+	1 sign not specific for portal hypertension and 1 histological lesion not specific for PSVD

Criteria in the definition of PSVD

	Signs of portal hypertension	Signs of portal hypertension
Specific	Gastric oesophagael, or ectopic varices Portal hypertensive bleeding Porto-systemic collaterals at imaging	Obliterative portal venopathy (thickening of vessel wall, occlusion of the lumen, and vanishing of portal veins) Nodular regenerative hyperplasmia Incomplete septal fibrosis or cirrhosis
Not specific	Ascites Platelet count <150 000 per µL Spleen size ≥13 cm in the largest axis	Portal tract abnormalities (multiplication, dilation of arteries, periportal vascular channels, and aberrant vessels) Architectural disturbance: irregular distribution of the portal tracts and central veins Non-zonal sinusoidal dilation Mild perisinusoidal fibrosis

Hepatic vein catheterisation may also play a potential diagnostic role being **the HVPG significantly lower in PSVD patients than in cirrhotic patients**. However, a large overlap between cirrhosis and PSVD exists. Moreover, HVPG determination is not available in all centers, and more importantly, the reliability of such determination in a disease in which the portal hypertension is typically pre-sinusoidal is arguable. **Probably, a low HVPG supports the diagnosis of PSVD**.

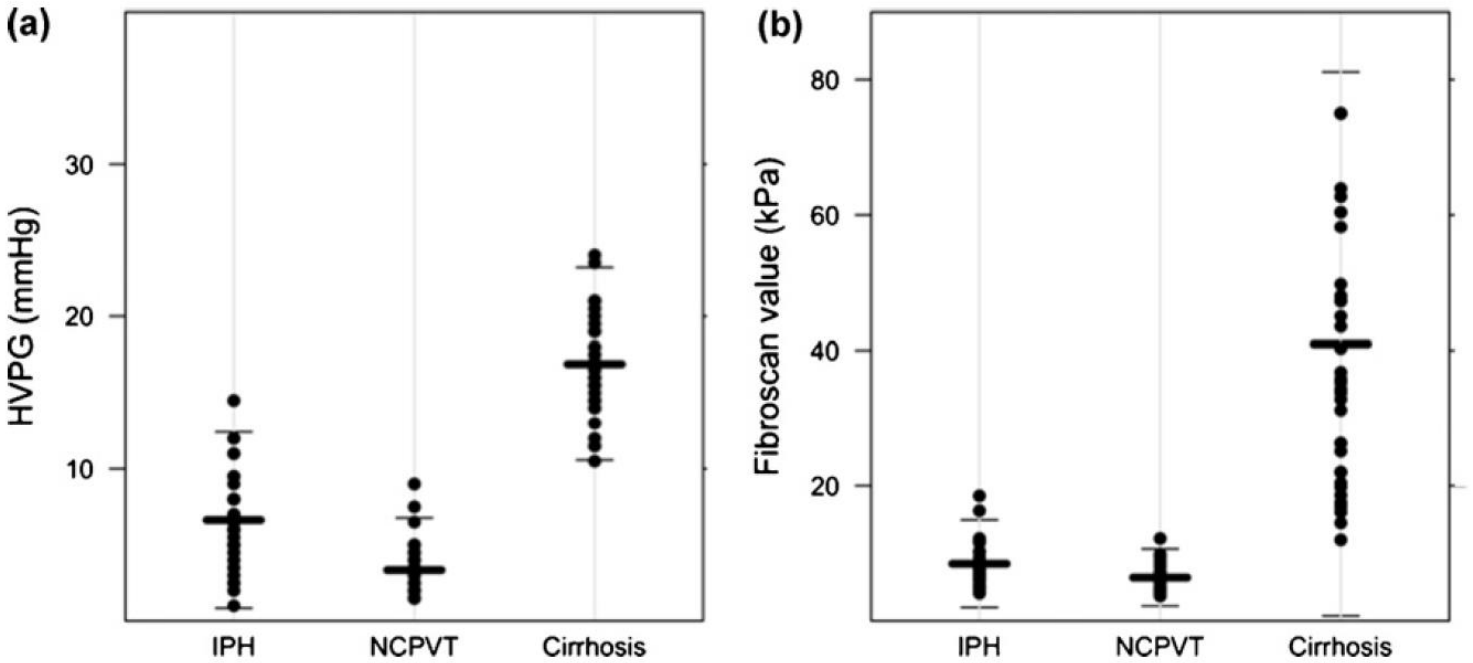
A De Gottardi ed al. Lancet Gastroenterol and Hepatol 2019

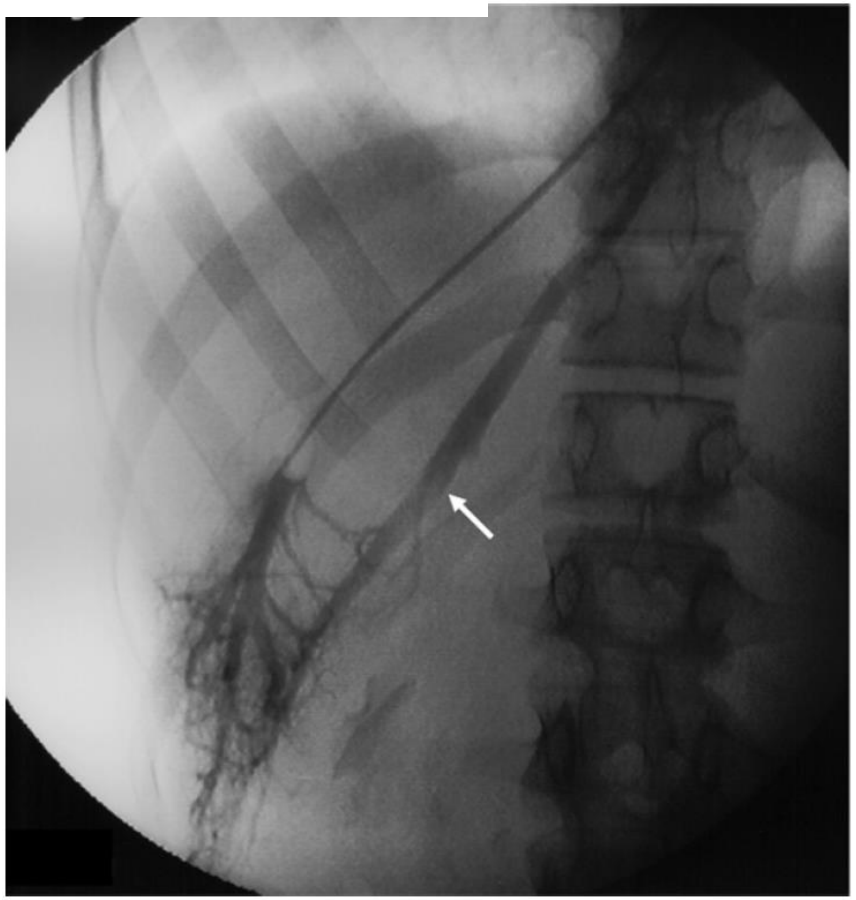
Role of hepatic vein catheterisation and transient elastography in the diagnosis of idiopathic portal hypertension

Susana Seijo[a], Enric Reverter[a], Rosa Miquel[b], Annalisa Berzigotti[a,c,d], Juan G. Abraldes[a,c], Jaume Bosch[a,c], Juan Carlos García-Pagán[a,c,*]

39 pts with idiopathic portal hypertension (mean HVPG 7,1 mmHg)
39 non cirrhoti portal vein thrombosis (mean HVPG 3,5 mmHg)
39 pts with cirrhosis (mean HVPG 17,1 mmHg)

HVPG and LS value is lower than in cirrhosis





Large vein to vein comunications is frequent in idiopathic portal hypertension (49%)

S. Seijo et al. DLD 2012

Nagoya J. Med. Sci. **81**. 19–30, 2019
doi:10.18999/nagjms.81.1.19

Pulmonary Hypertension: Diagnosis, Management, and Treatment

Takahisa Kondo[1], Naoki Okumura[1], Shiro Adachi[1], and Toyoaki Murohara[2]

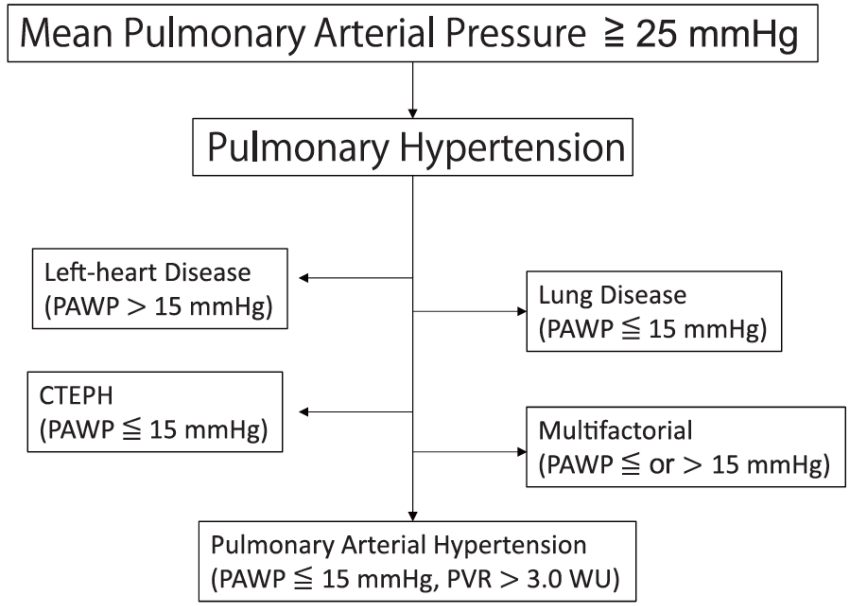


Fig. 1 Diagnostic algorithm for pulmonary arterial hypertension

The **right heart catheterization**, measuring several vascular pulmonary parameters, **is the only necessary tool to obtain the correct diagnosis**, according to the current criteria.

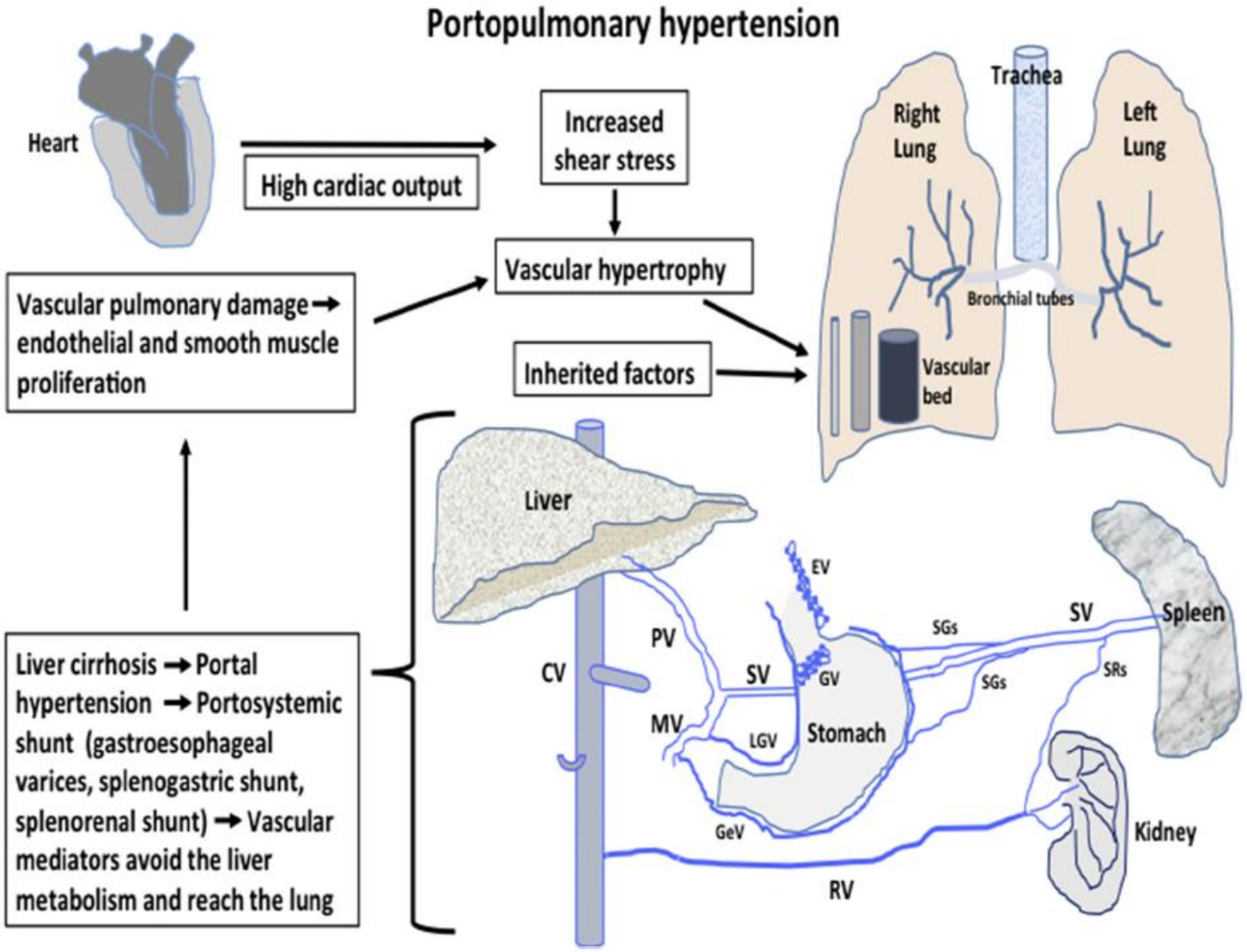
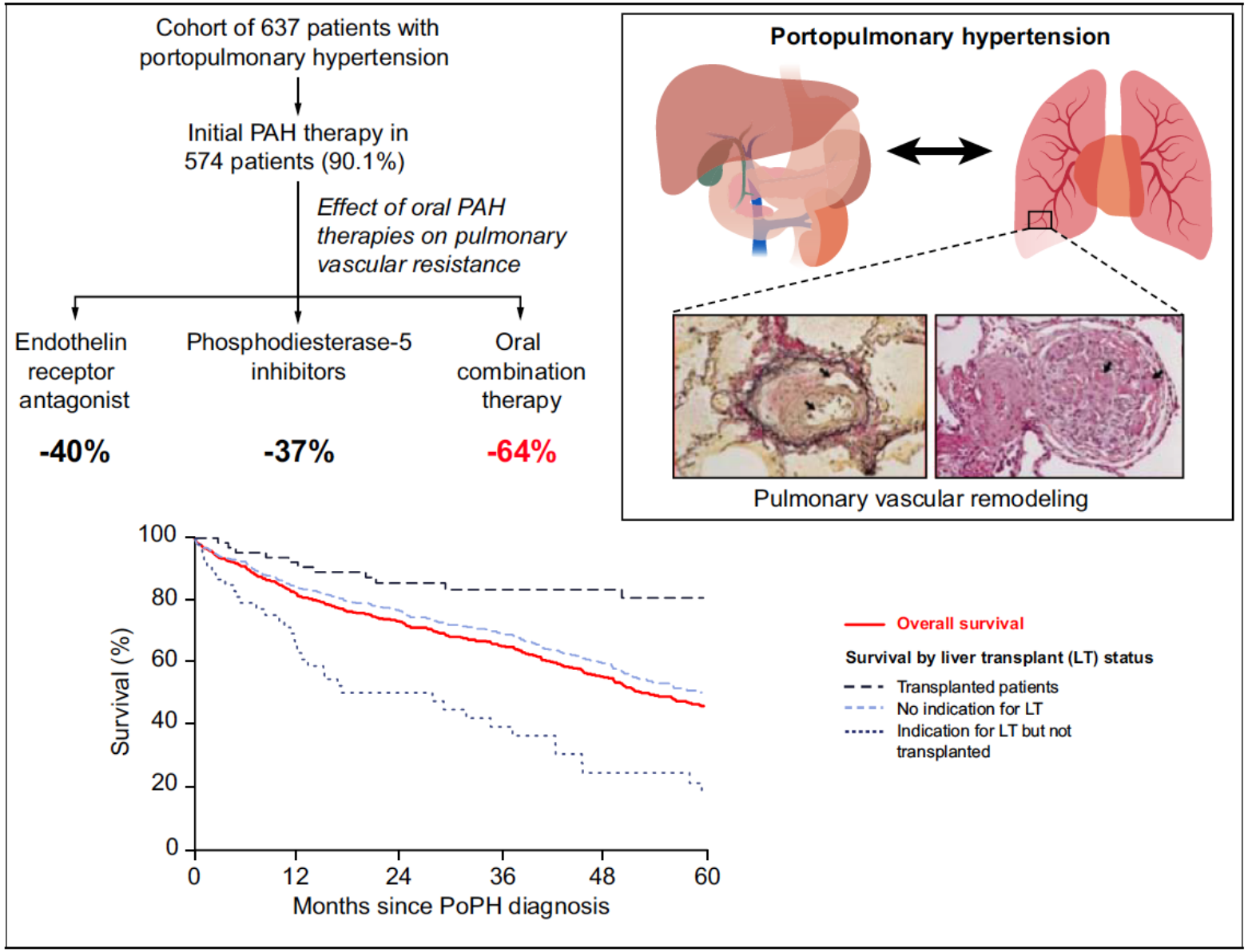


Fig. 1. The basic pathophysiology of portopulmonary hypertension starting from the liver cirrhosis.

E. Zardi et al. Eur J Intern Med. 2017 Sep
T. Kondo et al. Nagoya J. Med. Sci. 81. 19–30, 2019

Portopulmonary hypertension in the current era of pulmonary hypertension management



L. Savale JHEP 2020

TJLB per lesioni focali

Transjugular biopsy of a liver focal lesion in an obese patient using cone-beam computed tomography guidance

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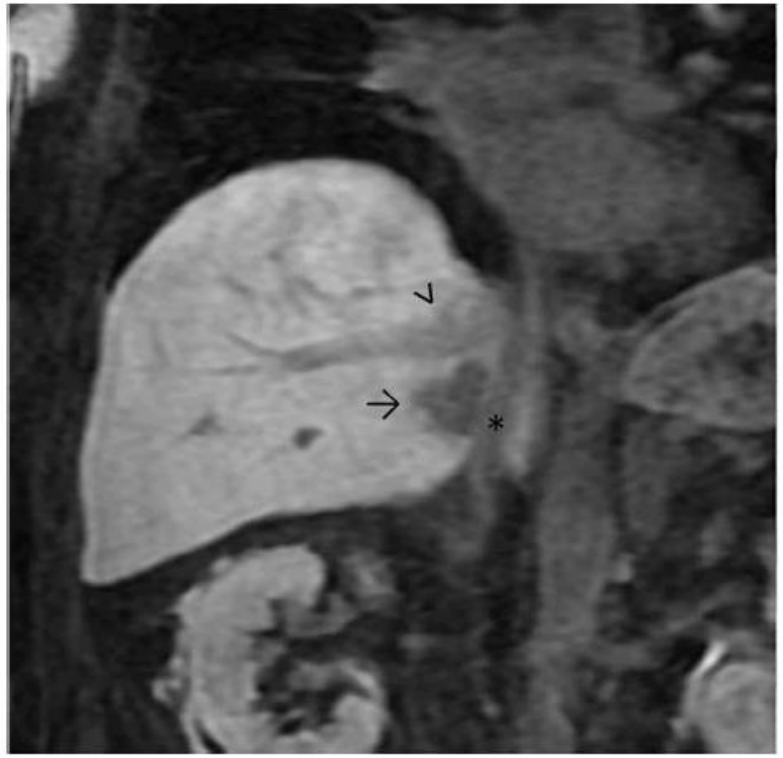
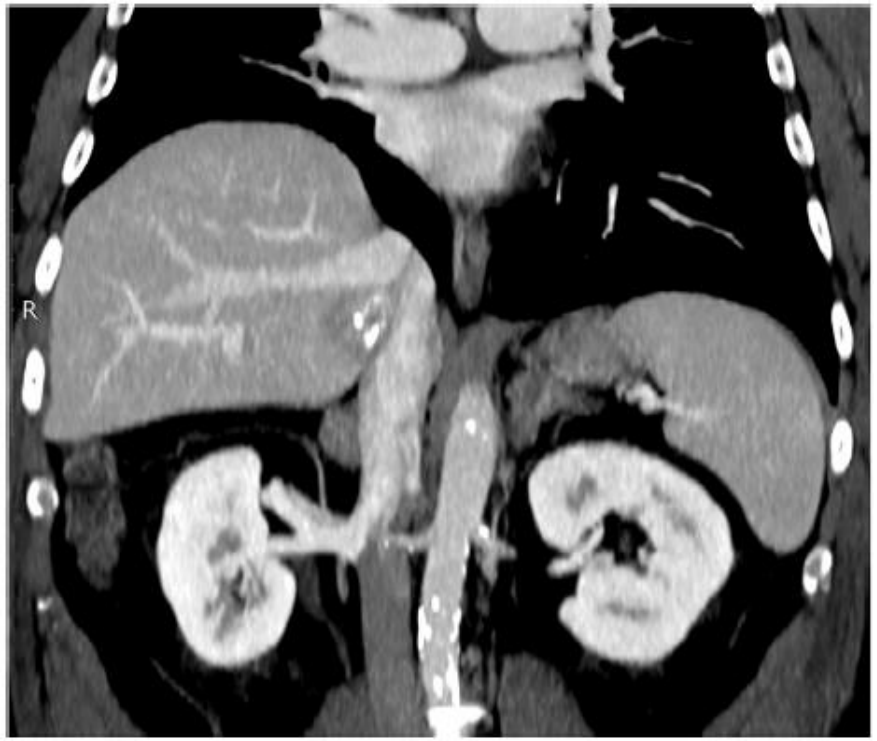
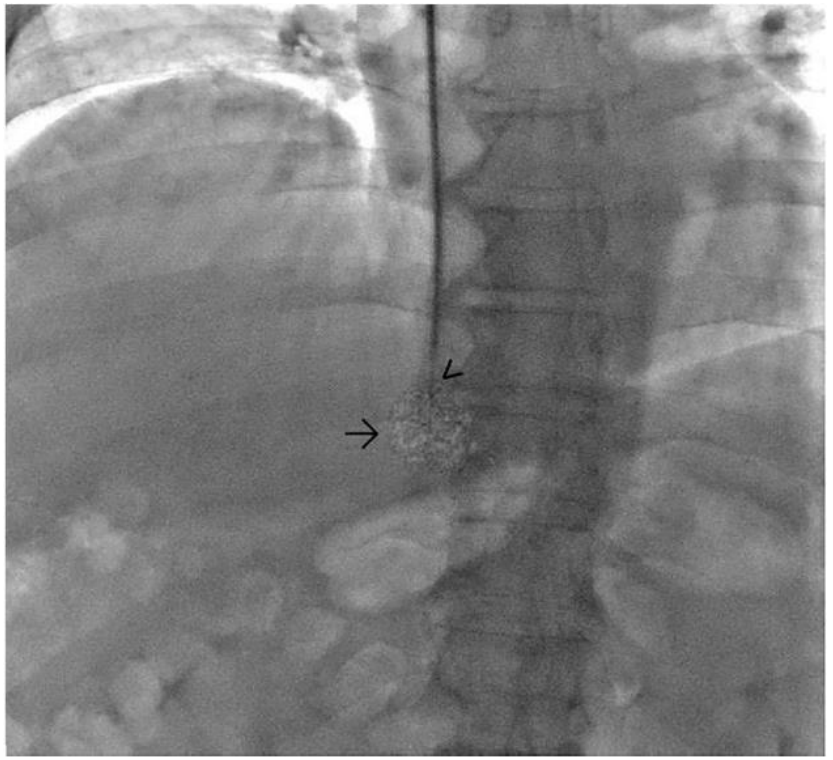
[b] *AITRI (Italian Association of Interventional Radiographers), Milan, Italy*

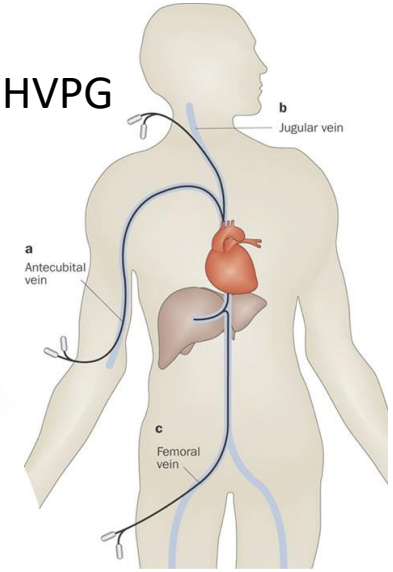


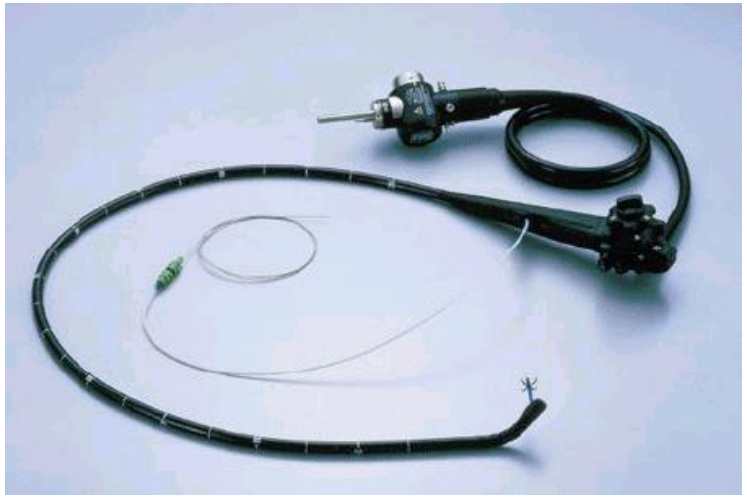


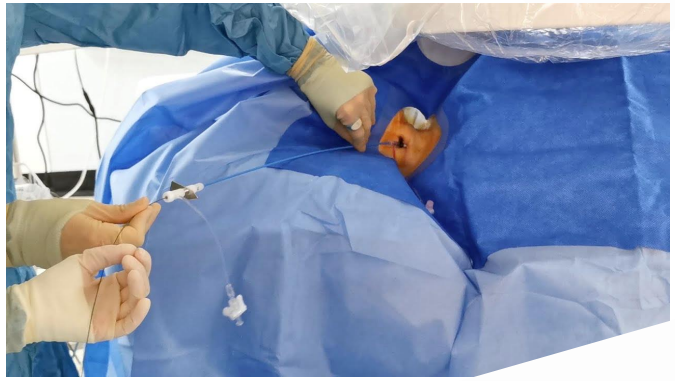


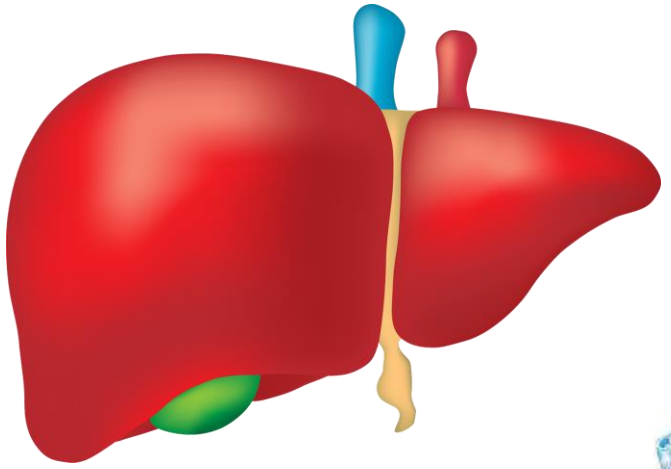
Conclusioni

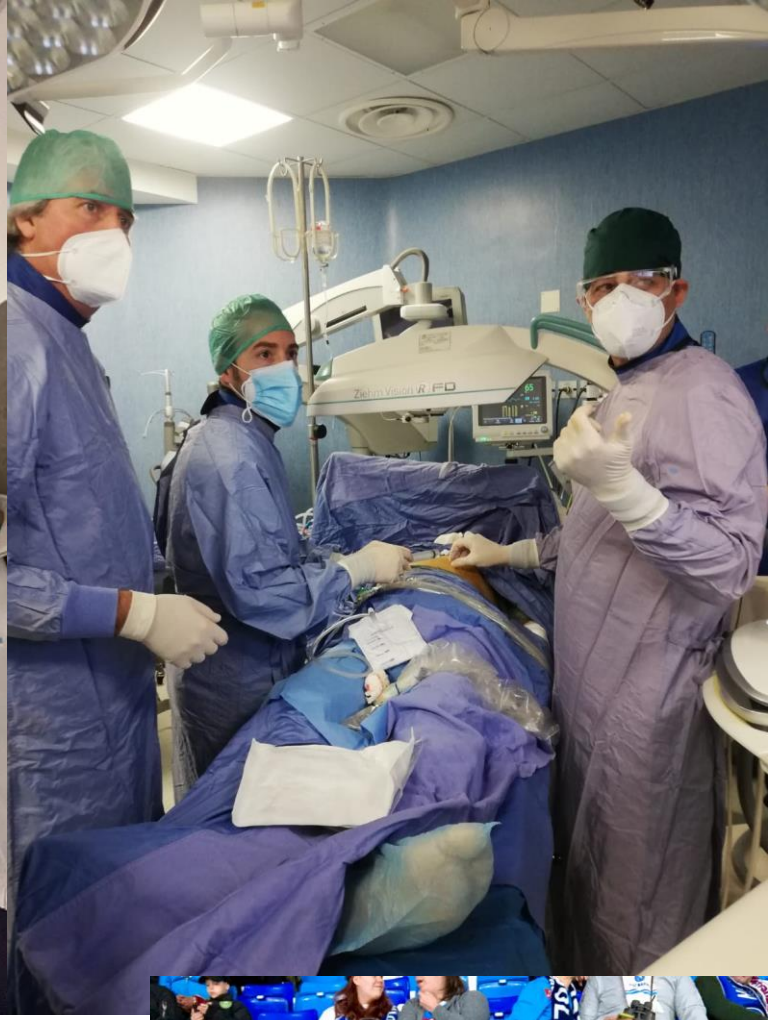
HVPG











Grazie
per
l’attenzione

Transjugular liver biopsy: What to do and what not to do

Shyamkumar N Keshava, Thomas Mammen, NRS Surendrababu, Vinu Moses
Department of Radiology, Christian Medical College, Vellore - 632 004, Tamil Nadu, India

What to do

Proper selection of the cases	Make sure that liver biopsy is required and PLB is not possible
Adequate support from USG	To confirm the patency of hepatic veins whenever relevant
	For jugular access
	Transabdominal USG while doing biopsy of a small liver
Type of needle	Tru-Cut (Quick-Core)
Biopsy of a 'stationary' liver to minimize injury	Breath-holding
Wedge the cannula against liver parenchyma	To turn the cannula anterior in the RHV, turn towards the right from MHV
Back-up facilities to manage complications	Facilities for angiogram and embolization

What not to do

Avoid carotid puncture	Patient can develop a neck hematoma, especially if the patient's bleeding parameters are deranged. A careful puncture under USG guidance can easily avoid this problem. Some people routinely use micropuncture to minimize the chances of hematoma by inadvertent carotid puncture.
Avoid arrhythmias	Minimize manipulation in the right atrium. It is mandatory to have facilities for treating arrhythmias and cardiac arrest. Usually the arrhythmia is transient.
Avoid air embolism	Air embolism can be fatal; do not leave any puncture needle/cannula open when its tip is inside a vein.
Avoid transcapsular puncture	It is possible that some of the punctures may be transcapsular in spite of all efforts to be strictly within the liver parenchyma. This may be due to less amount of liver tissue in front of the RHV, stretching of the hepatic vein, or entry of the cannula into the parenchyma, etc. A small liver poses the most problems. Gross ascites may be a compounding factor in the wrong estimation of the liver size on fluoroscopy. Liver size should be assessed based on the hepatic venography and not by a casual visual estimation of the distance from the midline to the lateral trunk wall!