DIAG2: What is the safety of liver biopsy?

Reference	Study type/ Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Source of funding
McGill DB, Racial J, Zinsmeister AR et al. A 21-year experience with major haemorrhage after percutaneous liver biopsy. *Gastroenterology.* 1990; 99(5):1396-1400. Ref ID: 670	3 prospective/ per – protocol case series	N=9212	**<u>Patient characteristics:</u>** Control group: **Male/female**: not reported **Median Age (range)**: 52 years (14-79) Haemorrhage group: **Male/female**: not reported **Median Age (range)**: 63 years (36-78yrs) Death group: **Male/female**: not reported **Median Age (range)**: 54 years (28-78yrs) The logistic regression analysis identified age (p<0.005), presence of malignancy (p<0.0001), pre-biopsy haemoglobin concentration (p<0.005), and number of passes (p<0.001) as univariately associated with complications	Percutaneous biopsy The patients that experienced death (n=10) or haemorrhage (n=22). Needle types: 1. Jamshidi suction. 2. Tru-Cut/Vim Silverman needle Outpatient: 6,631/9212 (72%) Inpatient: 2,581/ 9,212 (28%) Biopsies were performed intercostally except when a subcostal tumour nodule was identified by palpation.	Control group: a random sample of patients who did not experience haemorrhage at biopsy (n=231)	Not reported	Major Bleeding	Not reported
Effect Size Outcomes **Bleeding:** Haemorrhage with hypotension and transfusion or decrease in haemoglobin concentration ≥2 g/dl: 22/9212 (0.24%) An active bleeding site identified in patients who underwent surgery: 11/9212 (0.12%) Haemorrhage in patients with alcoholic liver disease:								

Non-fatal: 1/9212 (0.01%)
Fatal: 1/9212 (0.01%)
No specific disease saw an increase in the rate of haemorrhage
Needle type:
Tru-Cut/Vim Silverman needle:
Non-fatal haemorrhage: 14/9212 (0.15%) or 14/22* (63.6%) *(*22=total number of non-fatal haemorrhages)*
Jamshidi suction:
Non-fatal haemorrhage: 5/9212 (0.05%) or 5/22* (22.7%)
*(*22=total number of non-fatal haemorrhages)*
Approximately 1 in every 300 patients bleeds seriously.
Death:
Death due to haemorrhage directly related to the procedure despite emergency laparotomy: 10/9212 (0.11%)
Needle type:
Tru-Cut/Vim Silverman needle:
Fatal haemorrhage: 8/9212 (0.09%) or 8/10* (80%) *(*10=total number of fatal haemorrhages)*
Jamshidi suction:
Fatal haemorrhage: 2/9212 (0.02%) or 2/10*
(20%)
*(*10=total number of fatal haemorrhages)*

Reference	Study type/ Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Source of funding
Gilmore IT, Burroughs A, Murray LI et al. Indications, methods, and outcomes of percutaneous liver biopsy in England and Wales: an audit by the British Society of Gastroenterology and the Royal College	3- Audit of 80 liver biopsy procedures in 4 districts	N=1500	**Patient characteristics**: **Male/female**: 806 (54%)/694 (46%) **Median Age**: 60-69 years (6% in those over 80yrs) **Indications for biopsy:** **Chronic liver disease:** 563 (38%) **Unknown:** 11 (0.7%) **Other:** 152 (10%) **Transplant follow up:** 19 (1%) **Secondary cancer:** 507 (34%) **Primary** cancer: 52 **(3%)** **Active liver disease:** 196 (13%)	'Trucut' (Abbott) cutting type of needle: 66% Menghini-aspiration needle: 34 % Blind/non-U/S guided: 62% Image guide (mostly U/S): 38% Plugged (needle track filled with gelfoam): 7 (0.5%)	N/A	NA	Sample, complications, death, establishment of diagnosis and management change.	Not reported

of Physicians of London. *Gut.* 1995; 36(3):437-441. Ref ID: 526				Transjugular: 1 (0.07%) **Setting:** Inpatients: 42% Day cases: 4% Kept overnight: 23% Biopsy related admission >48 hrs: 29%				

Effect Size

Outcomes

Bleeding	**Mortality**
Procedures complicated by bleeding: 26/1500 (1.7%) Blood transfusions required: 11/1500 (0.7%) Laparotomy required: 1/1500 (0.07%) **Patients with INR 1.3-1.5:** Bleeding: 3.3% **Patients with INR >1.5:** Bleeding: 7.1% **Patients with raised bilirubin vs. normal:** Bleeding: 2.7% vs. 1.1% **Patients with platelet count <150 x 10^{9}/l:** Bleeding: 2.9% **Patients with platelet count >150 x 10^{9}/l:** Bleeding: 1.6% Frequency of bleeding with: **i) Menghini needle**: 1.3% **ii) Trucut needle**: 2.2%	Total mortality during 3 month follow up: 19% Death rate in patients with INR >1.5: 43% Death rate in patients with normal INR: 17% Deaths unequivocally related to biopsy: 2 (0.13%)- both during standard, unguided biopsy Deaths possible due to biopsy: 3/1500 (0.33%) **Death rate attributable to biopsy between 0.13- 0.33%** There were no differences in the frequency of bleeding between the different techniques (standard vs. image guided).

Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
van der Poorten D, Kwok A, Lam T et al. Twenty-year	3 20 year retrospective audit	N=1,398	**Patient characteristics**: **1986-1995:** **Male/female**: 301 (68%)/143 (32%) **Age Range**: 15-80 years	**1986-1995:** U/S guided using Bard Biopsy gun: 275 (61.9%)	N/A	Not reported	complications, factors associated with complicatio	None

audit of percutaneous liver biopsy in a major Australian teaching hospital. *Internal Medicine Journal.* 2006; 36(11):692-699. Ref ID:1978			**1996-2005:** **Male/female**: 631 (66%)/323 (34%) **Age Range**: 15-88 years **<u>Most common indications for biopsy:</u>** **Hepatitis C:** 37.8% **Hepatitis B:** 26.4% **Abnormal LFT:** 22.2%	Trucut needle: 20 (4.5%) Menghini needle: 88 (19.8%) Unspecified needle: 61 (13.7%) **1996-2005:** U/S guided using Bard Biopsy gun or Manan Pro-Mag gun: 87.9% Trucut or Menghini needles: 12.1%			ns	

Effect Size

Outcomes

Bleeding	Mortality
10 of 12 major complications related to haemorrhage **1986-1995:** Haemorrhage: 6/444 (1.35%) **1986-1995:** Haemorrhage: 4/766 (0.5%) Normal coagulation profile and frequency of haemorrhage: **1986-1995:** 2/391 (0.5%) **1996-2005:** 1/747 (0.13%) Abnormal coagulation profiles (platelet count ≤100 x 10^{9}/L, prothrombin time >1.6 s, INR >1.3) and frequency of haemorrhage: **1986-1995:** 4/53 (7.6 %) **1996-2005:** 3/21 (14.3%), p<0.001	**1986-1995:** Death: 2/444 (0.45%) **1996-2005:** Death: 1/766 (0.13%) All deaths related to haemorrhage

Reference	Study type/ Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Source of funding
Firpi RJ, Soldevila PC, Abdelmalek MF et al. Short recovery time after percutaneous liver biopsy: should we change our current practices? *Clinical Gastroenterology & Hepatology.* 2005; 3(9):926-929. Ref ID: 151	3 retrospective case series	N=3214	All patients including transplant recipients who underwent outpatient percutaneous liver biopsy. Standard laboratory criteria required before liver biopsy included haemoglobin >10 mg/dL, platelets >50,000/mL, prothrombin time <14 sec, INR <1.5 **<u>Patient Characteristics:</u>** Not reported **<u>Indications for biopsy:</u>** Not reported	**Before February 2002:** 15-gauge Jamshidi needle was used after percussion. **After February 2002:** U/S guidance was used	N/A	2 weeks	complications	Nor reported
Effect Size Outcomes **Bleeding:** Perihepatic bleeding: 579/3214 (18%) Hemothorax: **Pre-U/S use**: 8/3214 (0.2%) **U/S guided**: 0/3214 (0%) P=0.1 Minor bleeding at biopsy site: 129 /3214 (4%) **Death:** Death: 2/3214 (0.06%) 1 due to hemothorax and 1 blood loss								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow**	**Outcome measures**	**Source of funding**

						-up		
Manolakopoulos S, Triantos C, Bethanis S et al. Ultrasound-guided liver biopsy in real life: comparison of same-day prebiopsy versus real-time ultrasound approach. *Journal of Gastroenterology & Hepatology.* 2007; 22(9):1490-1493. Ref ID: 2004	II+	N=631	**Patient characteristics:** U/S guided: **Male/female**: 135 (56%)/106 (44%) **Age median (range)**: 48 years (17-76) **INR:** Median 1.14 (range 0.99-1.67) Non-U/S guided: **Male/female**: 276 (71%)/114 (29%) **Age median (range)**: 43 years (15-75) **INR**: Median 1.12 (range 1.02-1.3) In all patients the indication for biopsy was to establish a diagnosis and to assess severity of a suspected parenchymal chronic liver disease.	Real time U/S guided biopsy performed by radiologists Bard biopsy-cut needle 18 gauge n=241	U/S assessment of puncture site by a radiologist on the day of the biopsy, followed by biopsy performed unguided by a hepatologist/gastroenterologist using the marked site (on the ward) Trucut needle- 16 gauge n=390	24 hrs	Major complications	Not reported
Effect Size Outcomes **Bleeding:** U/S guided: no major bleeding complications Non-U/S guided: 1/390 (0.3%) - post-biopsy bleed requiring 2 units of blood. **No significant difference in complication rates between the U/S guided and non-U/S guided techniques** **Death:** U/S guided: no deaths Non-U/S guided: no deaths								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow**	**Outcome measures**	**Source of funding**

<table>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td>-up</td><td></td><td></td></tr>
<tr><td>Douds AC, Joseph AE, Finlayson C et al. Is day case liver biopsy underutilised ? Gut. 1995; 37(4):574-575. Ref ID: 500</td><td>3 retrospective case series</td><td>N=546</td><td>Patients were selected for day case biopsy if they:
a) were low risk for complications- no ascites, encephalopathy, coagulopathy (prothrombin time prolonged by >4 secs), and platelets >100 x 10 9/l;
b) had a reliable relative, partner or friend who could stay with them overnight following the biopsy;
c) Lived within 15 minutes of the hospital by car/ambulance.
d) Had access to a telephone.

<u>Patient characteristics:</u><table><tr><td></td><td>Day case</td><td>Non-day case</td></tr><tr><td>Male/ Female (%)</td><td>110(60)/ 72 (40)</td><td>139 (51)/ 132 (49)</td></tr><tr><td>Mean age (range)</td><td>46 (20-78)*</td><td>57 (0-90)</td></tr><tr><td>Suspected chronic liver disease (%)</td><td>170 (90)*</td><td>117 (43)</td></tr><tr><td>Suspected malignancy (%)</td><td>7 (5)*</td><td>124 (46)</td></tr><tr><td>Other (%)</td><td>4 (5)</td><td>30 (11)</td></tr></table>* significantly different from non-day case group (p<0.0001)</td><td>Day case percutaneous biopsy (performed within a 42 month period0

Included close observation for 7hrs post-biopsy

N= 182 (33%)

<u>Biopsy Techniques:</u>
Needle (%): 162 (92)*
U/S or CT guided (%): 14 (8)*
Operative (%): 0*

* significantly different from non-day case group (p<0.0001)</td><td>Non-day case percutaneous biopsy

N=364

Patient notes obtainable= 271

<u>Biopsy Techniques:</u>
Needle (%): 107 (39)
U/S or CT guided (%): 120 (44)
Operative (%): 44 (16)</td><td>8 months</td><td>complications</td><td>Not reported</td></tr>
<tr><td colspan="9">Effect Size
Outcomes</td></tr>
</table>

Bleeding:
Non-day case biopsy: 4/271 (1.5%) –haemorrhage (3 requiring transfusion)
Day case biopsy: 0
Death:
Non-day case biopsy: 1/271 (0.4%) - post-haemorrhage and embolisation.
Day case biopsy: 0

NB. No significant difference in total or individual complication rates between the 2 groups.

<table>
<tr><th>Reference</th><th>Study type/ Evidence level</th><th>Number of patients</th><th>Patient characteristics</th><th>Intervention</th><th>Comparison</th><th>Length of follow-up</th><th>Outcome measures</th><th>Source of funding</th></tr>
<tr>
<td>Perrault J, McGill DB, Ott BJ et al. Liver biopsy: complications in 1000 inpatients and outpatients. Gastroenterology. 1978; 74(1):103-106. Ref ID:1990</td>
<td>3 prospective case series</td>
<td>N=1000</td>
<td>Exclusion criteria: Absolute contraindications to biopsy were (1) a haemoglobin concentration of <9.5g per dl; (2) a prothrombin time longer than 25 sec (control 17 to 19 sec; (3) patients were uncooperative (4) had any of the following: moderate ascites, fever or sepsis, pronounced obesity, anaemia with haemoglobin of 9.5-10.5g per dl, prothrombin time 24-25 sec and deep jaundice.

Patient Characteristics:
<table>
<tr><th></th><th>In-patient n=171</th><th>Out-patient n=829</th></tr>
<tr><td>Male/ Female (%)</td><td>103(60)/ 68 (40)</td><td>456 (55)/ 373 (45)</td></tr>
<tr><td>Mean age (range)</td><td>48 (19-79)</td><td>48 (11-84)</td></tr>
</table>
The inpatient and outpatient groups</td>
<td>Percutaneous biopsy: inpatients n=171

Site:
Transthoracic: 81%
Subcostal: 18%
Both: <1%

Across groups:
Needle type:
Tru-cut 2mm: 781 patients (78%)
JAM-Shidi 1.9mm: 167 patients (17%)
Franklin-Silverman: 48 patients (5%)</td>
<td>Percutaneous biopsy: outpatients n=829

Site:
Transthoracic: 81%
Subcostal: 18%
Both:1%

Across groups:
Needle type:
Tru-cut 2mm: 781 patients (78%)
JAM-Shidi 1.9mm: 167 patients (17%)
Franklin-Silverman: 48 patients (5%)</td>
<td>Up to 4 days</td>
<td>complications</td>
<td>Not reported</td>
</tr>
</table>

			were nearly identical with respect to age, male predominance, site of biopsy, and number of passes. The outpatient group had a significantly higher percentage of patients with hepatitis-cirrhosis ans a lower percentage of patients with neoplasia (p<0.01). Within the inpatient group 9.4% had 1 or more relative contraindications compared with 3.3% of the outpatient group (p<0.01)					
Effect Size Outcomes Bleeding: No significant bleeding occurred in 8/171(4.7%) inpatients in whom complications developed.								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Gamble P, Colapinto RF, Stronell RD. Transjugular liver biopsy: A review of 461 biopsies. ***Radiology.*** **1985; 157(3):589-593**. Ref ID: 1222	3 case series	N= 436 (number of biopsies performed = 461)	For the majority of patients (88%) transvenous biopsy was performed because of contraindications for percutaneous liver biopsy due to severe coagulation abnormalities (65%) or massive ascites (23%). **Patient characteristics:** **Male/female**: 296 (64%)/165 (36%) **Age**: 15-82 years (average: 51.6 years) **Histological diagnosis of successful biopsies:** **Alcoholic liver disease** (cirrhosis, alcoholic hepatitis): 224 (51%) **Non-alcoholic cirrhosis**: 37 (8%) **Acute hepatitis:** 16 (4%)	Transjugular biopsy Modification of the Ross transeptal needle. Biopsy sample obtained using the Menghini 'one second' technique.	N/A	Not reported	Sinusoidal pressure, quality of sample, complications	Not reported
Effect Size								

Outcomes

Bleeding	Mortality	Perforation	Infection
Bleeding from puncture site in neck: 8/461 (1.7%) Carotid artery puncture: 3/461 (0.7%) Intraperitoneal haemorrhage: 4/461 (0.9%)	Mortality: 2/461 (0.5%) 1 death occurred where the biopsy may have contributed to the death (the patient was hypotensive post-biopsy with signs of intraperitoneal haemorrhage and suffered a cardiac arrest). 1 death occurred 12 days following the biopsy due to multiple cardiac arrhythmias and hepatic and renal failure.	Capsular perforation: 18/461 biopsies (3.9%) Perforation was noted at the time of biopsy and resolved with Gelfoam: 17/461 biopsies (3.6%) Biopsies resulted in patients continuing to bleed post-embolization but were resolved with conservative management: 2/461 (0.4%) An unrecognized capsular perforation leading to an intraperitoneal haemorrhage: 1/461 (0.2%)	All patients with pyrexia or rigors (35/461 (7.6%)) had negative blood cultures.

Reference	Study type/ Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Source of funding
Vlavianos P, Bird G, Portmann B et al. Transjugular liver biopsy: Use in a selected high risk population. *European Journal of Gastroenterology and Hepatology.* 1991; 3(6):469-472. Ref ID:1706	3 prospective case series	N=104	Included patients were those in whom percutaneous liver biopsy was contraindicated because of a prothrombin time extended for more than 6s compared with control (following vitamin K) (n=85), a platelet count < 40,000/mm³ n=12) or tense ascites (n=8) **Patient characteristics:** **Male/female:** 71(68%)/33 (32%) **Age (mean ± s.d. years):** 42.2 ± 14.8 12 (11%) of patients proved to have alcoholic liver disease **Indications for biopsy:** i) unknown cause of liver disease	Transjugular biopsy Menghini technique	N/A	Not reported	Success of biopsy, complications	Not reported

			on clinical and laboratory ground; ii) to confirm a suspected diagnosis based on clinical and laboratory parameters, such as autoimmune chronic active hepatitis (CAH) or Wilson's Disease iii) to exclude a treatable lesion such as CAH, haemochromatosis or Wilson's disease in patients in whom other diagnoses were more likely; iv) Guide further therapy in known liver disease in conditions such as hepatitis B related CAH or autoimmune CAH.					
Effect Size Outcomes **Bleeding:** Haemorrhage: 1/104 (0.96%) **Death:** Death: 1/104 (0.96%) -due to sutured subcapsular haematoma 30hrs after biopsy. **Perforation:** Capsular perforation: 6/104 (6%) 2 cases: renal and adipose tissue obtained 4 cases: perforation of liver capsule								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Velt PM, Choy OG, Shimkin PM et al. Transjugular liver biopsy in high-risk patients with hepatic disease. *Radiology.* 1984;	3 retrospective case series	**N=160**	**Indications for TJLB (vs. percutaneous)** included: 11/160 (7%) coagulopathy, 8/160 (5%)thrombocytopenia, 38/160 (24%) massive ascites **Biopsy results**: Patients with documented alcohol abuse and stable clinical condition N=54 including 38/54 (70%) Laennec cirrhosis, 2/54 (4%)	Tranjugular liver biopsy Seldinger percutaneous technique Modification of the Ross transeptal needle	NA	Not reported	Biopsy results, complications	Not reported

153(1):91-93 Ref ID: 1700			chronic active hepatitis Patients with documented alcohol abuse and sudden deterioration in clinical condition N=48 including 26/48 (54%) Laennec cirrhosis, 2/48 (42%) alcoholic hepatitis, 3/48 (6%) chronic active hepatitis					
Effect Size Outcomes **Perforation:** 1/160 (0.6%) pneumothorax								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Maharaj B, Bhoora IG. Complications associated with percutaneous needle biopsy of the liver when one, two or three specimens are taken. *Postgraduate Medical Journal.* 1992; 68(806):964-967. Ref ID: 601	3 retrospective/ prospective case series	N=2646	Inclusion criteria included a platelet count > 100 x 10^9/l and a prothrombin time > 75%	Percutaneous liver biopsy Tru-Cut needle One sample N=834	Two samples N=983 Three samples N=829	≥ 24 hrs	complications, histological diagnosis	South African Medical Research Council POST-Intern Scholarship
Effect Size Outcomes **Death:** Death 8/2646 (0.3%) (all due to intraperitoneal bleeding) **Infection:**								

Biliary peritonitis 1/2646 (0.04%)								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Colombo M, Del NE, de FR et al. Ultrasound-assisted percutaneous liver biopsy: superiority of the Tru-Cut over the Menghini needle for diagnosis of cirrhosis. *Gastroenterology.* 1988; 95(2):487-489 Ref ID: 741	II+	N=1192	Patients with diffuse liver disease who had prothrombin time and partial thromboplastin time values within three standard deviations of the normal mean, platelet counts >80 000 cells/mm³ and bleeding time > 7 min. An area 5 x 5 cm of hepatic surface and >5 cm depth had to be identified **Histological diagnosis included**: 29/1192 acute hepatitis, 749/1192 chronic hepatitis, 205/1192 cirrhosis	Percutaneous transthoraic Menghini needle. 1.60 mm diameter Ultrasound guided N=615	Percutaneous transthoraic Tru-Cut needle. 2.05 mm diameter Ultrasound guided N=577	24 hrs	Histological diagnosis, success of biopsy, complications	Ricerche Finalizzate grant
Effect Size Outcomes **Bleeding:** N=3 >5% drop in hematocrit (no transfusion required)								
Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Wawrzynowicz SM, Kruszewski T, Boron KA. Complications of percutaneous	3 Case series	N=861 (no. of liver biopsies)	**Inclusion criteria**: indications for biopsy included various parenchymal liver disease. **Exclusion criteria:** patients with focal lesions on U/S and patients with a platelet count <50,000/mm³ and/or prothrombin activity below	Percutaneous biopsy Menghini needle (1.4-1.8 mm) U/S guidance	NA	≥24 hrs	complications, indication fro biopsy.	Not reported

liver biopsy. *Romanian Journal of Gastroenterology.* 2002; 11(2):105-107. Ref ID: 2000			50%. **Baseline Characteristics**: **Male/Female**: 484 (56.3%)/ 376 (43.7%) Alcoholic liver disease accounted for 119 examinations (13.8%)	was sometimes used				
Effect Size Outcomes **Bleeding:** - 4/861 (0.46%) cases of haemoperitoneum - 1/861 (0.11%) case of haemothorax **Death:** - no cases reported **Perforation:** **-** 2/861 (0.23%) cases of pneumothorax - 2/861 (0.23%) cases of perforation of another viscera(kidney) **Infection:** **-** 1/861 (0.11%) case of septic shock								

Reference	**Study type/ Evidence level**	**Number of patients**	**Patient characteristics**	**Intervention**	**Comparison**	**Length of follow-up**	**Outcome measures**	**Source of funding**
Myers RP, Fong A, Shaheen AAM. Utilization rates, complications and costs of percutaneous liver biopsy: A population-based study including 4275 biopsies. *Liver International.*	3 retrospective case series	N=4275 (biopsies) N=3627 (patients)	Patients who had undergone percutaneous liver biopsy Patient population: 53% male, median age 50 yrs 25/32 patients with complications had cirrhosis	Percutaneous No further details provided	NA	Not reported	Complications	Clinical investor Award from the Alberta Heritage Foundation for Medical Research.

2008; 28(5):705-712. Ref ID: 1459								

Effect Size
Outcomes
Bleeding 15/4275 (0.35%)

Mortality 6/4275 (0.14%):
Bleeding 5/6
Aspiration pneumonia 1/6

Fever 3/4275 < 0.0001%

Reference	Study type/ Evidence level	Number of patients	Patient characteristics	Intervention	Comparison	Length of follow-up	Outcome measures	Source of funding
Piccinino F, Sagnelli E, Pasquale G et al. Complications following percutaneous liver biopsy. A multicentre retrospective study on 68,276 biopsies. *Journal of Hepatology.* 1986; 2(2):165-173. Ref ID:795	3 Retrospective case series of 36 Liver Units	N=68,276	No centre performed liver biopsy on patients with a prothrombin activity below 50% and a platelet count below 50,000/mm³ **Patient characteristics:** Not reported	Transthoracic percutaneous liver biopsy: - Menghini's technique (1.6 or 1.4mm) n=60,611 (89%) - Trucut needle n=7,372 (11%) - Vim-Silverman needle n=293 (0.4%)	NA	Not reported	Complications	C. and The Italian Association for the Study of the Liver (AISF)

Effect Size
Outcomes

Bleeding	Mortality	Perforation	Infection
Haemoperitoneum: Menghini's technique: 15/ 60,611 (0.025%) Trucut needle: 7/7,372 (0.095%) Vim-Silverman needle: 0/293 (0%) TOTAL: 22/68,276 (0.032%) In patients with cirrhosis: 7/22,729 (0.031%) **Intrahepatic haematoma:** Menghini's technique: 3/60,611 (0.005%) Trucut needle: 1/7,372 (0.14%) Vim-Silverman needle: 0/293 (0%) TOTAL: 4/68,276 (0.0059%) In patients with cirrhosis: 1/22,729 (0.004%) **Haemobilia:** Menghini's technique: 3/60,611 (0.005%) Trucut needle: 1/7,372 (0.014%) Vim-Silverman needle: 0/293 (0%) TOTAL: 4/68,276 (0.0059%) In patients with cirrhosis: 1/22,729 (0.004%) **Haemothorax:** Menghini's technique: 9/60,611 (0.015%) Trucut needle: 3/7,372 (0.041%) Vim-Silverman needle: 0/293 (0%) TOTAL: 12/68,276 (0.018%) In patients with cirrhosis: 5/22,729 (0.022%)	**Death:** Menghini's technique: 3/60,611 (0.005%) Trucut needle: 3/7,372 (0.04%) Vim-Silverman needle: 0/293 (0%) TOTAL: 6/ 68,276 (0.009%) Death only occurred in patients with cirrhosis or neoplastic disease.	**Pneumothorax:** Menghini's technique: 18/60,611 (0.030%) Trucut needle: 6/7,372 (0.081%) Vim-Silverman needle: 0/293 (0%) TOTAL: 24/68,276 (0.35%) In patients with cirrhosis: 8/22,729 (0.035%) **Lung Puncture:** Menghini's technique: 1/60,611 (0.0017%) Trucut needle: 0/7,372 (0%) Vim-Silverman needle: 0/293 (0%) TOTAL: 1/68,276 (0.014%) In patients with cirrhosis: 1/22,729 (0.004%) **Colon Puncture:** Menghini's technique: 2/60,611 (0.0033%) Trucut needle: 1/7,372 (0.014%) Vim-Silverman needle: 0/293 (0%) TOTAL: 3/68,276 (0.004%) In patients with cirrhosis: 1/22,729 (0.004%) **Kidney Puncture:** Menghini's technique: 2/60,611 (0.003%) Trucut needle: 0/7,372 (0%) Vim-Silverman needle: 0/293 (0%) In patients with cirrhosis: 0/22,729 (0%) **Gallbladder puncture:** Menghini's technique:	**Sepsis:** Menghini's technique: 6/ 60,611 (0.0099%) Trucut needle: 0/7,372 (0%) Vim-Silverman needle: 0/293 (0%) TOTAL: 6/68,276 (0.0088%) In patients with cirrhosis: 4/22,729 (0.018%)

		8/60,611 (0.013%) Trucut needle: 0/7,372 (0%) Vim-Silverman needle: 0/293 (0%) TOTAL: 8/68,276 (0.012%) In patients with cirrhosis: 3/22,729 (0.013%)	