



PARIS MASH MEETING

11th edition

Organized by
Arun Sanyal & Lawrence Serfaty

September 11 & 12, 2025
Institut Pasteur, Paris





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MASH
MEETING**

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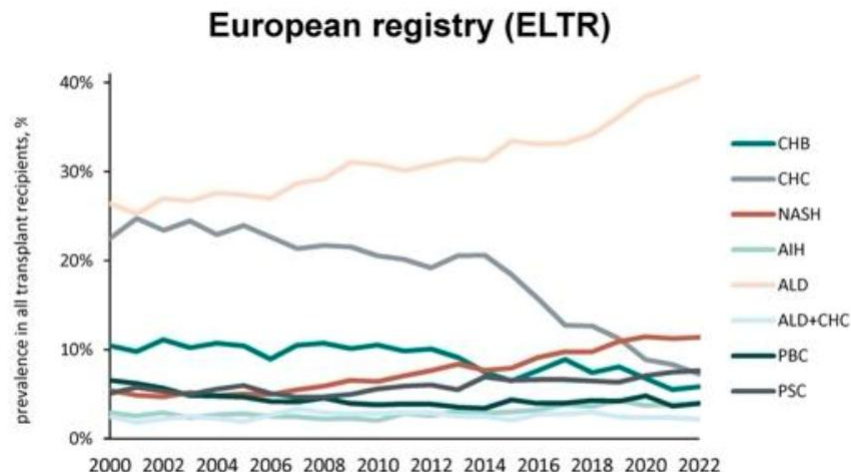
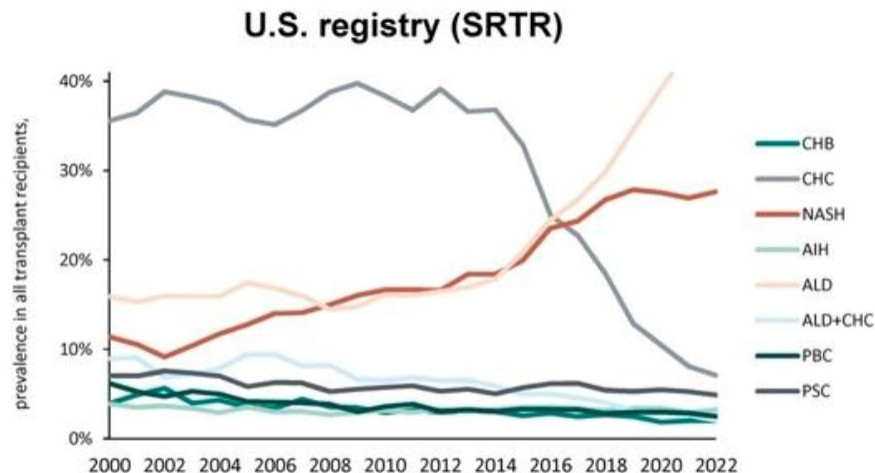


Do patients with MASH develop post-transplant cancers with greater frequency?

Christophe Moreno

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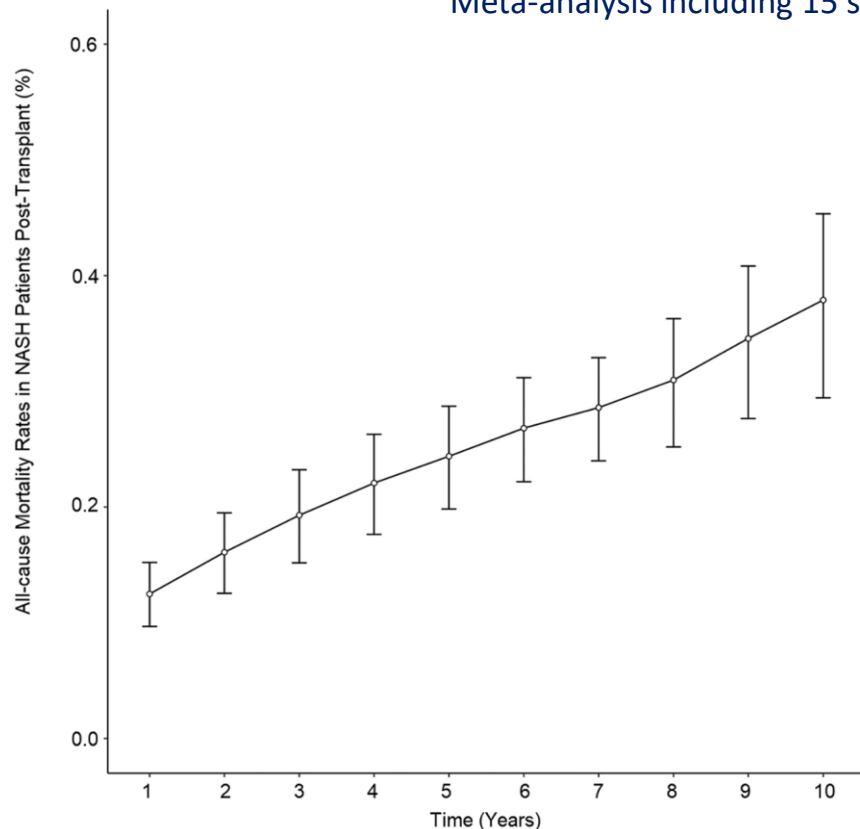
SLD is the first indication of LT in Europe and US



-MASLD/MASH is the second indication for LT in Europe and US, after ALD

-LT for MASLD/MASH is more frequent in US > Europe

Meta-analysis including 15 studies and 119.327 LT recipients

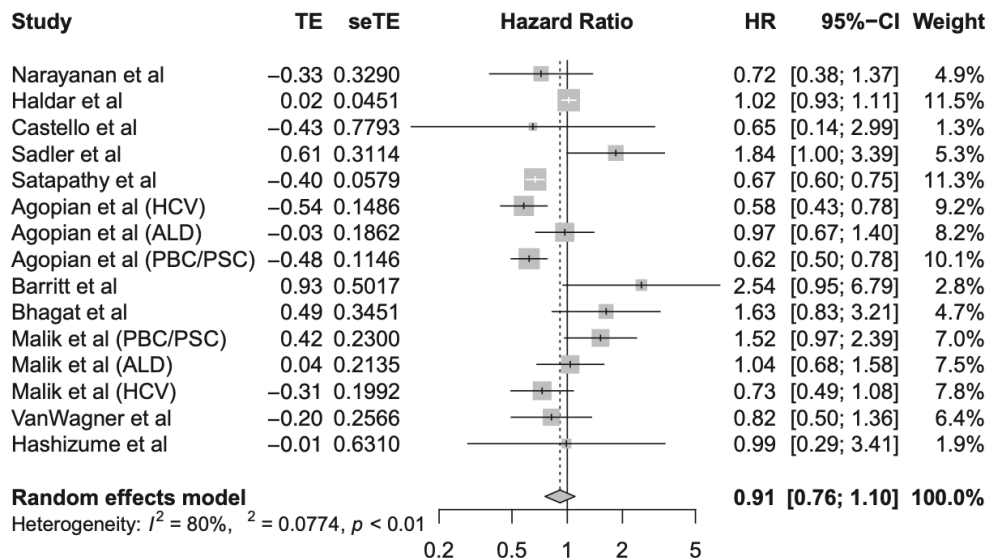


Time	All-cause Mortality Rates in NASH Patients Post-Transplant (%)	95% CI
1	12.5	9.70 - 15.2
2	16.1	12.5 - 19.5
3	19.3	15.2 - 23.2
4	22.1	17.6 - 26.3
5	24.4	19.8 - 28.7
6	26.8	22.2 - 31.2
7	28.6	24.0 - 32.9
8	31.0	25.2 - 36.3
9	34.6	27.6 - 40.8
10	37.9	29.4 - 45.3

Yong JN et al, CGH 2023

Overall survival is comparable between patients who underwent
LT for MASH vs non-MASH

Overall Survival



Yong JN et al, CGH 2023

- Malignancies (solid organ tumors and lymphoproliferative disorders)
- Recurrence of liver disease
- Cardiovascular diseases

- Malignancies (solid organ tumors and lymphoproliferative disorders)
- **Recurrence of liver disease**
 - MASLD recurrence in > 80% of LT recipients transplanted for MASLD/MASH
 - No significant impact on graft survival
- Cardiovascular diseases

- Malignancies (solid organ tumors and lymphoproliferative disorders)
- Recurrence of liver disease
- **Cardiovascular diseases**
 - MASH is associated with the risk of major adverse cardiovascular events after LT (conflicting results)
 - Recent studies did not show a higher risk of mortality from cardiovascular-related events in recipients transplanted for MASLD/MASH

VanWagner LB et al, Am J Transplant 2016
Konerman MA et al, Transplantation 2017
Yong JN et al, CGH 2023

- Leading cause of death > 1 year post-LT
- Incidence rate for de novo malignancy: **2-22%**
- Incidence increased in long-term survivors
- Occur in younger patients ++ compared to general population
- Frequently more aggressive tumors (higher grading, higher T stages)

Schrem H et al, Liver Transplant 2013
Watt KDS et al, Gastroenterology 2009

Standardized incidence ratio (SIR) ~ 2-2.5

Author	Country	Year	Total patients (n)	DNM patients (n)	Transplantation period	SIR	DNM incidence (%)
Jiang et al. [3]	Canada	2008	2,034	113	1983–1998	2.5	5.6
Engels et al. [4]	USA	2011	37,888	1,563	1995–2004	2.1	4.1
Taborelli et al. [5]	Italy	2019	2,832	266	1985–2014	1.8	9.4
Sérée et al. [8]	France	2018	11,226	1,200	1993–2012	2.2	10.7
Park et al. [6]	Korea	2012	1,952	44	1998–2008	7.7 (M), 7.3 (F)	2.3
Shin et al. [9]	Korea	2013	1,180	34	1995–2010	–	2.9
Kaneko et al. [10]	Japan	2013	360	27	1996–2012	1.8	7.2
Gao et al. [11]	China	2015	466	14	2005–2012	9.5	3.0
Park et al. [12]	Korea	2019	3,822	213	2007–2015	3.43 (M), 2.30 (F)	5.6
Kim et al. [7]	Korea	2021	1,793	70	1988–2018	–	3.9

M, male; F, female; –, not available.

Type of malignancy

1. Skin cancers (40-45%)
2. Hematological (PTLD) (10-15%)
3. Solid organ tumors (40-45%)

Risk factors

- Male gender
- Age
- White race
- Previous malignancy
- Indication of LT (ALD, PSC, ...MASLD/MASH?)

Watt KDS et al, Gastroenterology 2009

Bhat M et al, Transplantation 2019

Schrem H et al, Liver Transplant 2013

All (n = 11,226)

Localization (ICD-10)	Observed	Expected	SIR (95% CI)
All neoplasms	1200	545	2.20 (2.08-2.33)
Lip-mouth-pharynx (C00-C14)	72	33	2.20 (1.72-2.77)
Esophagus (C15)	52	11	4.76 (3.56-6.24)
Stomach (C16)	10	10	1.06 (0.51-1.94)
Colorectal (C18-C21)	79	55	1.45 (1.15-1.81)
Liver (C22)	4	14	0.29 (0.08-0.73)
Pancreas (C25)	17	12	1.40 (0.81-2.24)
Larynx (C32)	76	10	7.57 (5.97-9.48)
Lung (C34)	188	73	2.56 (2.21-2.95)
Skin melanoma (C43)	8	14	0.59 (0.25-1.15)
Breast (C50)	44	55	0.81 (0.59-1.08)
Cervix (C53)	4	3	1.27 (0.34-3.24)
Uterus (C54)	8	7	1.14 (0.49-2.25)
Ovary (C56)	5	5	1.05 (0.34-2.46)
Prostate (C61)	71	82	0.86 (0.67-1.09)
Testicle (C62)	0	3	0.00 (0.00-1.19)
Kidney (C64)	30	18	1.69 (1.14-2.41)
Bladder (C67)	17	17	0.98 (0.57-1.56)
CNS (C69-C72)	4	8	0.53 (0.14-1.35)
Thyroid (C73)	3	10	0.32 (0.07-0.92)

- Large French cohort of LT
- 11226 LT patients between 1993-2012
- Majority of ALD and viral cirrhosis
- Nonmelanoma skin cancers excluded

Sérée O et al, *Transplantation* 2018

2000 LT between 1/1983-12/2010, Hannover, Germany

Underlying liver diseases with the highest cancer risk

-ALD (esophageal and oral cancer)

-PSC (colorectal cancer)

Indication for LT

Total (n)

Acute liver failure	206
Alcoholic cirrhosis	98
Autoimmune hepatitis	43
Budd-Chiari syndrome	45
Caroli disease	11
<u>Cryptogenic cirrhosis</u>	86
Primary metabolic liver disease	367
Hepatitis B virus cirrhosis	186
Hepatitis C virus cirrhosis	122
HCC	265
Non-HCC tumors	105
PBC	111
Polycystic disease	77
PSC	180
Secondary biliary cirrhosis	35
Small-for-size liver syndrome after liver resection	13
Other	50
Total:	2000

Schrem H et al, Liver Transplantation 2013

11004 adults LT between 2000-2013, national French database

		risks factors for malignancy	
		SHR ^a (95% CI)	
		Bivariate	Multivariate
Age (years)		1.04 (1.03–1.04)	1.03 (1.03–1.04)
Gender	M vs. F	1.61 (1.41–1.82)	1.45 (1.27–1.67)
Nb of LT	1 vs. >1	1.30 (1.04–1.61)	1.35 (1.09–1.69)
Donor age (years)		1.00 (1.00–1.00)	1.00 (1.00–1.00)
Donor type	Death vs. Living	1.79 (1.23–2.56)	1.67 (1.14–2.38)
Type of initial liver disease			
	Metabolic disease	1 (reference)	1 (reference)
	Alcohol-related	2.14 (1.61–2.86)	1.63 (1.22–2.17)
	Viral hepatitis B	1.22 (0.82–1.81)	1.05 (0.71–1.55)
	Viral hepatitis C	1.25 (0.91–1.71)	1.03 (0.75–1.41)
	Primary sclerosing cholangitis	1.94 (1.32–2.86)	1.98 (1.34–2.91)
	Other cirrhosis	1.41 (0.97–2.04)	1.31 (0.91–1.89)
	Acute liver failure	0.95 (0.62–1.45)	1.11 (0.72–1.70)
	Congenital liver disease	1.23 (0.74–2.05)	1.36 (0.82–2.25)
	Other liver disease	1.42 (0.95–2.13)	1.48 (0.98–2.23)
	Primary liver tumor	2.61 (1.95–3.49)	1.88 (1.41–2.54)
Initial immunosuppressive treatment after LT			
CNI	Ciclo vs. Tacro	0.98 (0.86–1.13)	0.92 (0.80–1.06)
antimetabolite	None	1 (reference)	1 (reference)
	Mycophenolate	0.86 (0.61–1.21)	0.92 (0.65–1.31)
	Azathioprine	1.00 (0.90–1.10)	0.96 (0.87–1.07)
corticosteroids	yes vs. no	1.01 (0.76–1.34)	1.04 (0.78–1.39)
anti-lymphocytes antibodies	yes vs. no	0.80 (0.62–1.02)	0.88 (0.68–1.14)

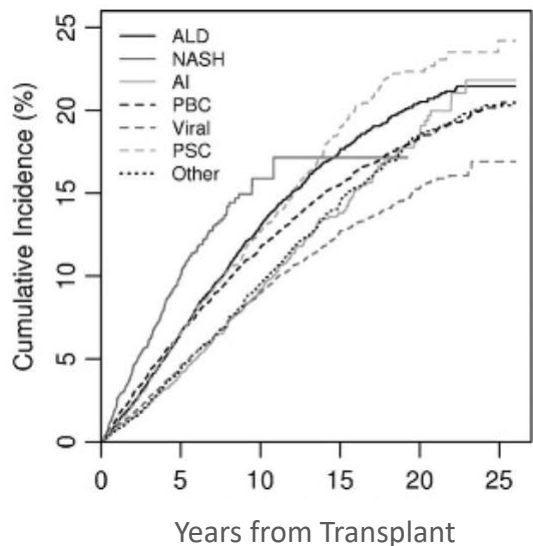
108412 LT between 1987-2015, SRTR US database

Univariate and Multivariable analysis for Predictors of Malignancies

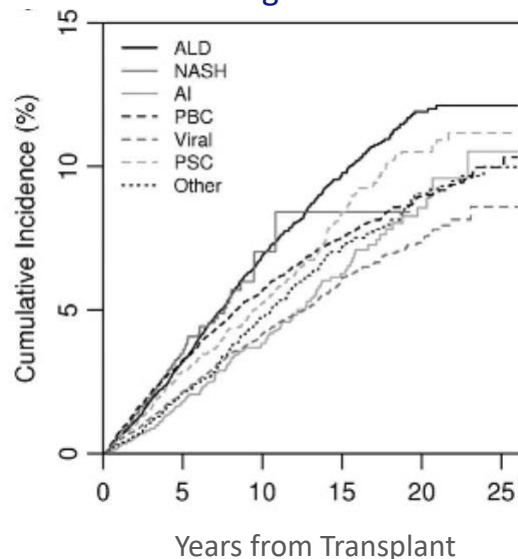
Variables	Univariates	P	Multivariables	P
	HR (95% CI)		HR (95% CI)	
Age (per decade)	1.56 (1.53-1.59)	<0.001	1.52 (1.47-1.56)	<0.001
Sex—Male	1.45 (1.39-1.51)	<0.001	1.28 (1.21-1.36)	<0.001
Obese	1.05 (1.01-1.10)	0.027	0.97 (0.92-1.02)	0.26
Ethnicity				
African American	0.51 (0.46-0.56)	<0.001	0.59 (0.52-0.67)	<0.001
Hispanic	0.49 (0.45-0.53)	<0.001	0.51 (0.46-0.56)	<0.001
Asian	0.49 (0.43-0.57)	<0.001	0.44 (0.37-0.53)	<0.001
Other	0.69 (0.55-0.87)	0.001	0.77 (0.59-1.01)	0.056
White	1.00		1.00	
Diabetes	1.11 (1.06-1.17)	<0.001	0.97 (0.91-1.03)	0.31
Diagnosis				
Alcohol	1.33 (1.25-1.42)	<0.001	1.37 (1.27-1.48)	<0.001
Autoimmune	0.94 (0.83-1.06)	0.32	1.37 (1.16-1.63)	<0.001
Fatty liver	1.88 (1.66-2.12)	<0.001	1.35 (1.17-1.55)	<0.001
Hepatitis B	0.87 (0.76-0.99)	0.030	1.04 (0.87-1.24)	0.71
PBC	0.92 (0.83-1.01)	0.083	1.06 (0.91-1.22)	0.46
PSC	1.21 (1.11-1.33)	<0.001	1.59 (1.42-1.79)	<0.001
Other	1.27 (1.20-1.34)	<0.001	1.30 (1.21-1.39)	<0.001
Hepatitis C	1.00			
Previous malignancy	1.63 (1.53-1.73)	<0.001	1.34 (1.25-1.44)	<0.001
Multiorgan transplant	1.24 (1.13-1.36)	<0.001	1.35 (1.19-1.53)	<0.001

108412 LT between 1987-2015, SRTR US database

Cumulative incidence of malignancies
overall



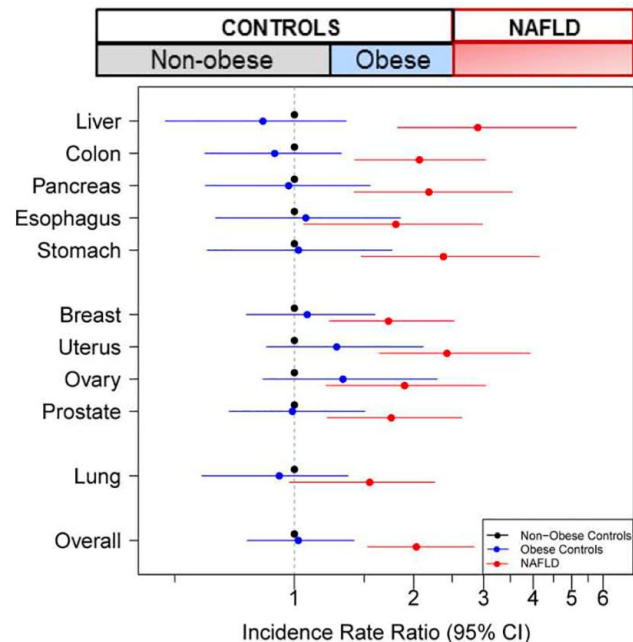
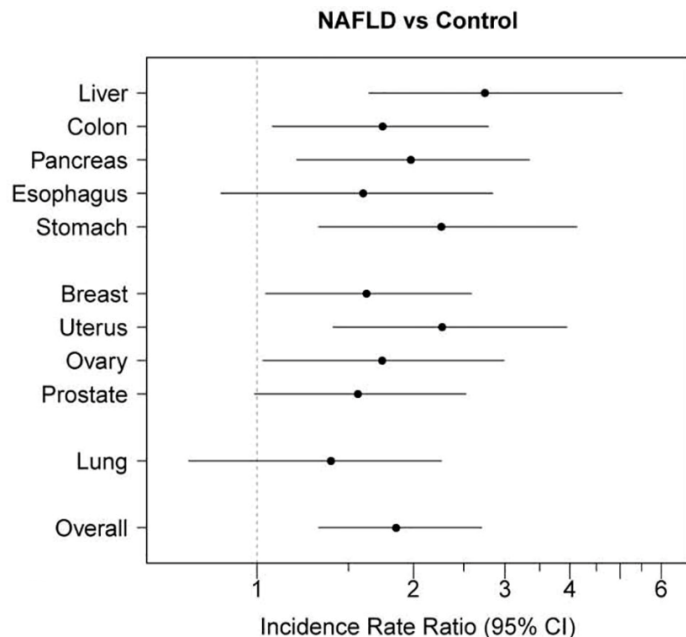
Cumulative incidence of solid organ
malignancies



Is an increased risk of malignancies in MASH LT expected?

Lessons from the non-transplant MASLD population

4722 incident NAFLD cases from US population (Minnesota) 1997-2016

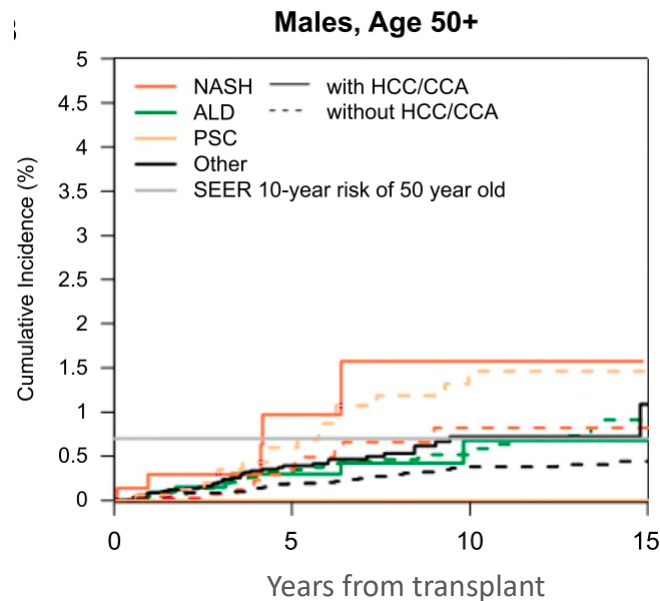
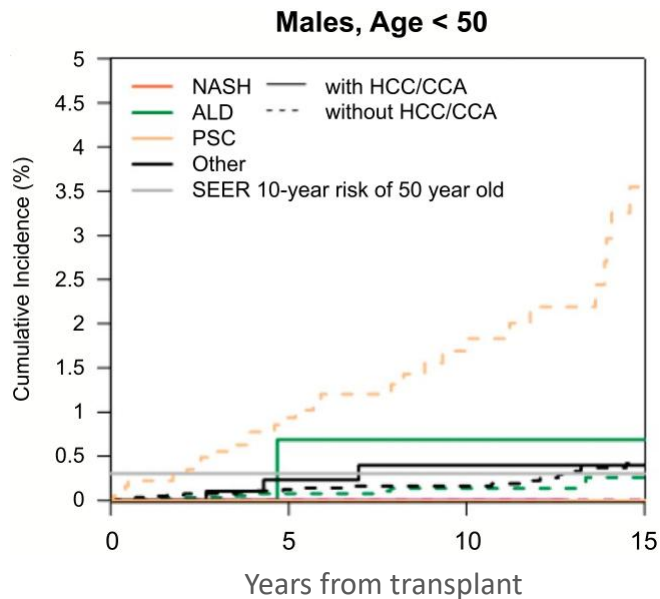


Allen AM et al et al, J Hepatol 2019

Which solid organ tumors with the highest risk after LT for MASLD?

GI malignancies in adult LT from UNOS database US 1997-2017

Colorectal cancer



Which solid organ tumors with the highest risk after LT for MASLD?

GI malignancies in adult LT from UNOS database US 1997-2017

Colorectal cancer

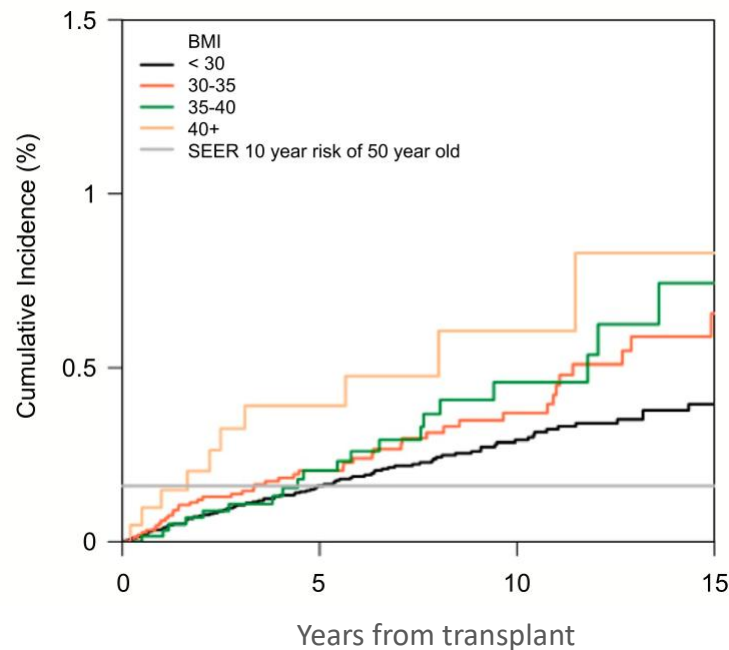
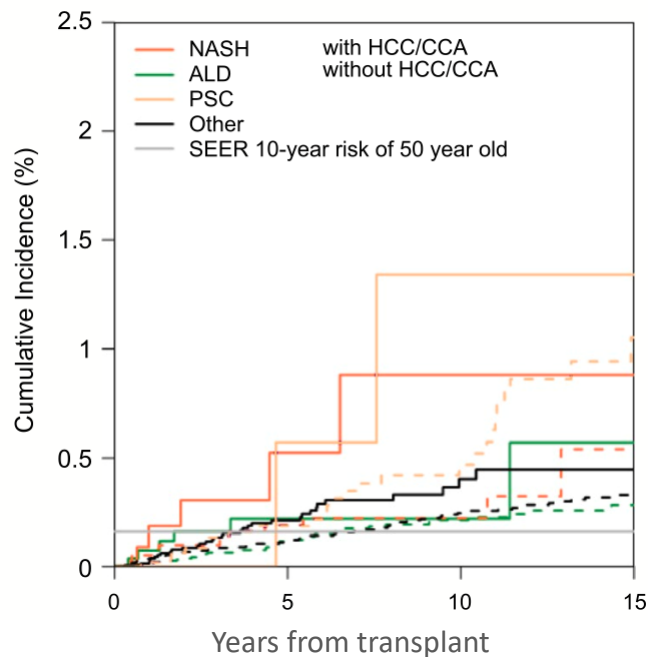
Variable	Colorectal	
	HR (95% CI)	PValue
Age (per decade)	1.52 (1.35-1.71)	<0.001
Gender, male	0.75 (0.60-0.93)	0.010
Obese	0.85 (0.68-1.07)	0.17
Non-Caucasian	0.71 (0.54-0.93)	0.012
Diabetes	1.09 (0.85-1.40)	0.51
Diagnosis		
PSC, HCC/CCA	1.39 (0.19-10.29)	0.74
PSC	4.32 (3.21-5.79)	<0.001
NASH, HCC/CCA	2.51 (1.07-5.90)	0.035
NASH	1.18 (0.74-1.89)	0.49
ALD, HCC/CCA	1.52 (0.73-3.18)	0.27
ALD	1.26 (0.95-1.67)	0.11
Other, HCC/CCA	1.47 (0.91-2.38)	0.12
Other	Reference	

Multivariable Cox proportional hazards regression

Which solid organ tumors with the highest risk after LT for MASLD?

GI malignancies in adult LT from UNOS database US 1997-2017

Pancreatic cancer



Which solid organ tumors with the highest risk after LT for MASLD?

GI malignancies in adult LT from UNOS database US 1997-2017

Pancreatic cancer

Variable	Pancreatic	
	HR (95% CI)	PValue
Age (per decade)	1.58 (1.33-1.87)	<0.001
Gender, male	1.16 (0.85-1.58)	0.36
Obese	1.47 (1.10-1.96)	0.009
Non-Caucasian	0.82 (0.58-1.16)	0.26
Diabetes	1.28 (0.93-1.76)	0.14
Diagnosis		
PSC, HCC/CCA	3.99 (0.91-17.44)	0.066
PSC	2.77 (1.76-4.34)	<0.001
NASH, HCC/CCA	1.70 (0.61-4.77)	0.31
NASH	0.93 (0.51-1.69)	0.82
ALD, HCC/CCA	1.00 (0.39-2.57)	0.99
ALD	0.86 (0.58-1.28)	0.47
Other, HCC/CCA	1.07 (0.58-1.97)	0.83
Other	Reference	

Multivariable Cox proportional hazards regression

Physiopathological rationale for an increased risk of cancer after LT for MASLD/MASH

Immunosuppression

Diabetes

Obesity

Increased cancer risk after LT

Chronic
inflammation

Age

Other unknown
factors...

Minimize exposure to CNi

- Cumulative exposure to Tacrolimus is predictor of post-LT malignancy
- Exposure to CNIs should be minimised by combining IS regimens (MMF, mTORi)
- mTORi? Only evidence that mTORi decrease incidence of non-melanoma skin cancer

Rodriguez-Peralvarez et al, Am J Transplant 2022
EASL CPG on LT, J Hepatol 2024
Knoll GA et al, BMJ 2014

Other measures

- Smoking cessation
- Avoiding alcohol consumption
- Metabolic risk factors should be treated according to current standards
- Healthy lifestyle (appropriate diet and physical activity to avoid weight gain)

EASL CPG on LT, J Hepatol 2024

Colon cancer

- Limited data
- In patients > 50 years transplanted for MASLD and HCC
- Screening colonoscopy at 5-year intervals after LT

Pancreatic cancer

- Very limited data, lower incidence
- Screening with cross-sectional imaging at 3-5 years intervals?
- Need further studies

Nasser-Ghods N et al, Hepatology 2021

Kang WH, Ann Liver Transplant 2024

Colmenero J et al, Transplantation 2022

- MASLD/MASH is rapidly increasing as indication for LT (US>Europe)
- De novo malignancies after LT are a leading cause of death > 1 year after LT
- Recent data suggest that LT for MASLD/MASH is associated with an increased risk of solid organ malignancy after LT (as ALD and PSC)
- Colorectal cancer (and pancreatic cancer) represent the solid organ tumors with the highest risk after LT for MASLD/MASH
- Specific screening strategies for colorectal (and pancreatic) cancer after LT for MASLD/MASH?

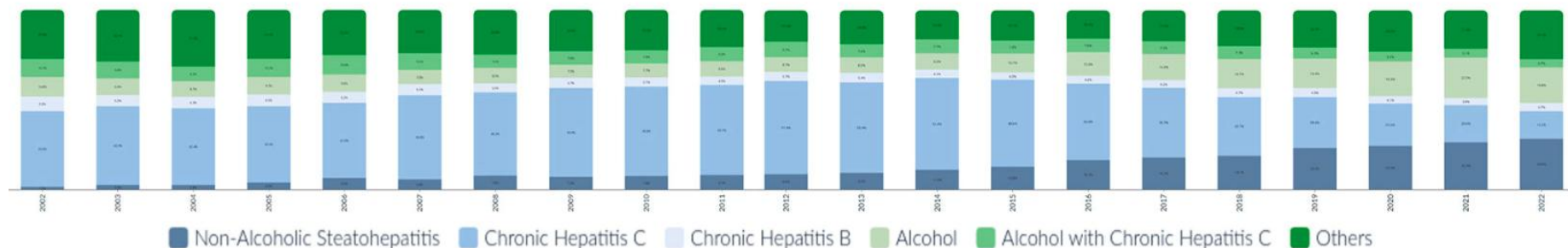


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What about LT for HCC in MASLD patients?

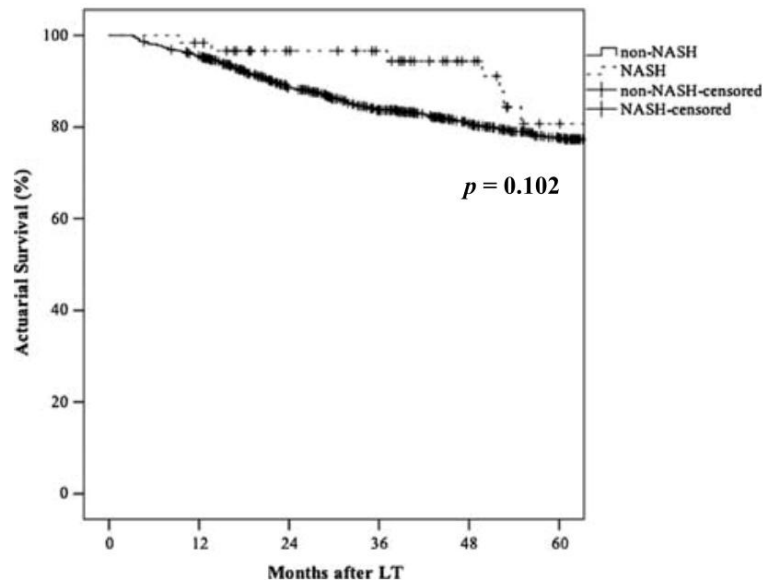
Liver Transplant Recipients with Hepatocellular Carcinoma



PROCARP national registry from UNOS database
2000-2022 (51.721 listed patients for HCC)

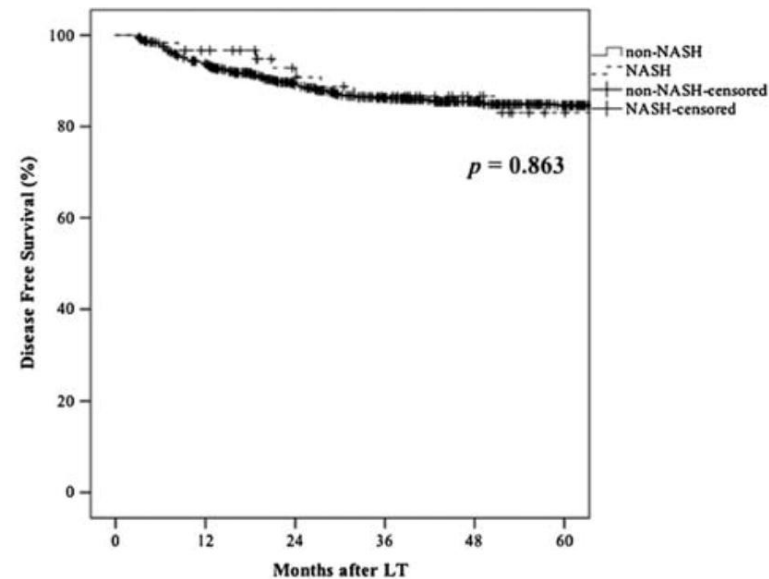
What about LT for HCC in MASLD patients?

Retrospective study, 2 centers (North America), 929 LT for HCC between 2004-2014



NASH	60	54	46	38	28	10
Non-NASH	864	779	651	551	463	221

Overall survival



NASH	59	52	44	31	23	9
Non-NASH	852	729	611	518	434	199

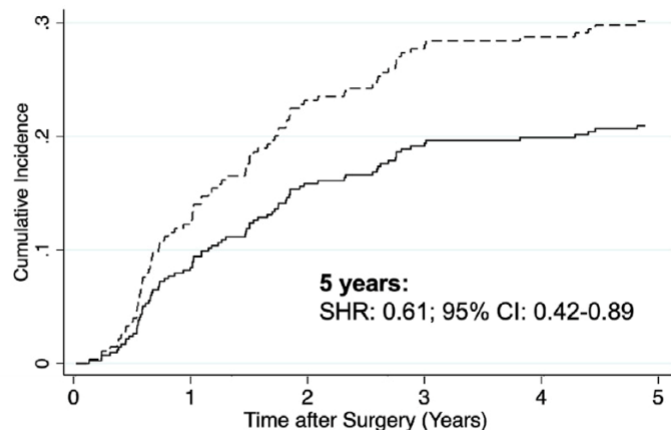
Disease-free survival

Sadler EM et al, Transplantation 2018

What about LT for HCC in MASLD patients?

Retrospective study, UNOS OPTN database, 7461 LT for HCC between 2012-2020

**Cumulative Incidence
of HCC Recurrence**

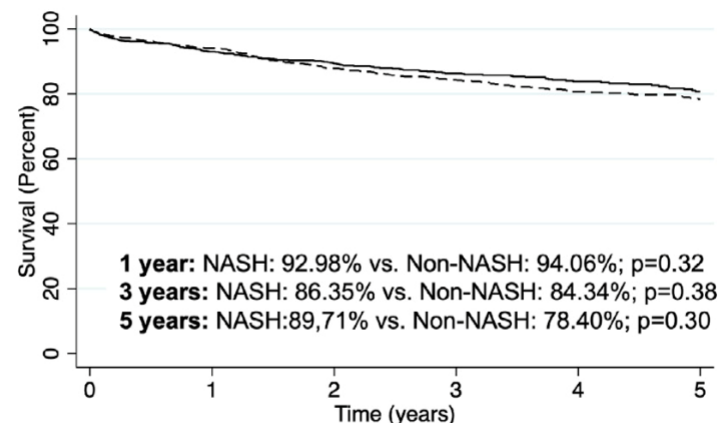


Number at risk

Time after Surgery (Years)	0	1	2	3	4	5
Non-NASH	1164	915	701	521	383	251
NASH	1167	871	635	458	331	221

----- Non-NASH ——— NASH

**Propensity Matched
Post-Transplant Survival**



Number at risk

Time (years)	0	1	2	3	4	5
Non-NASH	1167	942	719	539	391	259
NASH	1169	883	647	465	334	224

----- Non-NASH ——— NASH