12/2013

# Compared efficacy of preservation Solutions in liver transplantation:

## a long-term graft outcome study from the European Liver Transplant Registry.

**René ADAM**, Valérie DELVART, Vincent KARAM, Christian DUCERF, Francis NAVARRO, Christian LETOUBLON, Jacques BELGHITI, Denis PEZET, Denis CASTAING, Yves Patrice Le TREUT, Jean GUGENHEIM, Philippe BACHELLIER, Paolo MUIESAN

and all the ELTR contributing centres www.eltr.org

and the European Liver and Intestine Transplant Association (ELITA).

# Normalised intrinsic mortality risk in liver transplantation: European Liver Transplant Registry study

*Lancet* 2000; **356:** 621–27

*René Adam, Valérie Cailliez, Pietro Majno, Vincent Karam, Paul McMaster, Roy Y Calne, John O'Grady, Rudolf Pichlmayr, Peter Neuhaus, Jean-Bernard Otte, Krister Hoeckerstedt, Henri Bismuth*

| Factors | Risk ratio (95% CI) | p |
|---|---|---|
| **Adults** | | |
| Retransplantation | 2·94 (2·59–3·34) | 0·0001 |
| Cancer | 2·47 (2·22–2·74) | 0·0001 |
| Acute hepatic failure | 2·01 (1·77–2·27) | 0·0001 |
| Split-liver transplants in centres that do <20 | 1·60 (1·02–2·52) | 0·04 |
| <25 liver transplants per year | 1·50 (1·29–1·74) | 0·0001* |
| 25–90 liver transplants per year | 1·46 (1·31–1·62) | 0·0001* |
| Preservation liquid ≠UW | 1·34 (1·19–1·52) | 0·0001 |
| ABO compatibility | 1·23 (1·07–1·40) | 0·003† |
| ABO incompatibility | 1·31 (1·00–1·73) | 0·05† |
| Recipient age ≥60 years | 1·29 (1·14–1·47) | 0·0001 |
| Cold ischaemia ≥12 h | 1·17 (1·07–1·28) | 0·0008 |
| Donor age >55 years | 1·14 (1·02–1·28) | 0·03 |
| Donor sex matching | 1·11 (1·02–1·21) | 0·02 |
| **Children** | | |
| Cancer | 2·86 (1·79–4·58) | 0·0001 |
| Retransplantation | 2·69 (2·20–3·28) | 0·0001 |
| ABO incompatiblity vs isogroup | 2·21 (1·47–3·32) | 0·0001‡ |
| ABO compatibility vs isogroup | 2·06 (1·56–2·71) | 0·0001‡ |
| Acute hepatic failure | 2·03 (1·62–2·55) | 0·0001 |
| Split-liver transplants in centres that do <20 | 1·85 (1·23–2·78) | 0·003 |
| <25 liver transplants per year | 1·36 (1·07–1·71) | 0·01 |
| Cold ischaemic ≥12 h | 1·33 (1·10–1·61) | 0·003 |
| Recipient age <2 years | 1·22 (1·02–1·46) | 0·03 |

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Different solutions are used for organ preservation.
Each substantially differs in their composition, but the purposes of each are similar:

- to prevent cellular edema,
- to delay cell destruction,
- to maximize organ function after perfusion.

**TABLE 1 - Composition of the preservation solutions**

| | UW[3] | CS[3] | HTK[3] | IGL-1[3] | ST*[11] | EC[12] | LPD[12] |
|---|---|---|---|---|---|---|---|
| mOsm/l | 320 | 320 | 310 | 290 | 304 | 375 | 292 |
| HES | 0.25 | | | | | | |
| PEG-35 | | | | 0.03 | | | |
| $Na^+$ | 27 | 100 | 15 | 120 | | 10 | 138 |
| $K^+$ | 125 | 15 | 10 | 25 | 16 | 115 | 6 |
| $Cl^-$ | | | 50 | | 160 | 15 | 142 |
| $Mg^{2+}$ | 5 | 13 | 4 | | 32 | | 0.8 |
| $Ca^{2+}$ | | 0.25 | 0.015 | 0.5 | 2.4 | | |
| $HCO_3^-$ | 5 | | | | | 10 | |
| $SO_4^-$ | 4 | | | 5 | | | 0.8 |
| $PO_4^-$ | 25 | | | 25 | | 57.5 | 0.8 |
| $H_2PO_4^-$ | | | | | | 42.5 | |
| Histidine | | 30 | 198 | | | | |
| Mannitol | | 60 | 30 | | | | |
| Lactobionate | 105 | 80 | | 100 | | | |
| Raffinose | 30 | | | 30 | | | |
| Glutathione | 3 | 3 | | 3 | | | |
| Adenosine | 5 | | | 5 | | | |
| Glutamate | | 20 | | | | | |
| Glucose (g/l) | | | | | | 35.7 | 0.91 |
| Dextran 40 (g/l) | | | | | | | 50 |

Concentrations are given in mmol/l, except where otherwise indicated.
Abbreviations: HES, hydroxyethyl starch; PEG-35, polyethylene glycol 35.
* Prior to the pH correction with sodium bicarbonate.

# LIVER PRESERVATION SOLUTIONS

- No large randomized study demonstrating any superiority of one solution over the others

- Clinical practice : limited retrospective studies and medico-economic factors…

# The Effect of Preservation Solutions for Storage of Liver Allografts on Transplant Outcomes

## *A Systematic Review and Meta-analysis*

*Annals Surg 2013*

*John M. O'Callaghan, MBBS,*† Robert D. Morgan, MBBS,* Simon R. Knight, MChir,*† and Peter J. Morris, FRS*†*

16 RCT / 11 same initial flush and storage solution

**TABLE 3.** Primary Nonfunction Rates in Included Studies

| | Solution 1 | | | | Solution 2 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Study** | | **N** | **n** | **%** | | **N** | **n** | **%** | **RR** | ***P*** | **Definition of Primary Nonfunction** |
| Erhard (1994) | UW | 30 | 1 | 3.33 | HTK | 30 | 1 | 3.33 | 1.00 | 1.00 | Undefined |
| Brolese (2008) | UW | 74 | 2 | 2.70 | HTK | 148 | 7 | 4.73 | 0.57 | 0.47 | Undefined |
| Nardo (2001) | UW | 90 | 1 | 1.11 | Celsior | 83 | 0 | 0.00 | 2.77 | 0.53 | Death or retransplantation in days 1–7 |
| Lama (2002) | UW | 10 | 0 | 0.00 | Celsior | 10 | 0 | 0.00 | 1.00 | 1.00 | Undefined |
| Pedotti (2004) | UW | 96 | 0 | 0.00 | Celsior | 79 | 1 | 1.27 | 0.27 | 0.43 | Undefined |
| García-Gil (2006) | UW | 51 | 0 | 0.00 | Celsior | 51 | 0 | 0.00 | 1.00 | 1.00 | Death or retransplantation in days 1–7 |
| Brolese (2008) | UW | 74 | 2 | 2.70 | Celsior | 82 | 0 | 0.00 | 5.53 | 0.46 | Undefined |
| Lopez-Andujar (2009) | UW | 103 | 2 | 1.94 | Celsior | 92 | 2 | 2.17 | 0.89 | 0.91 | Death or retransplantation in days 1–7 |
| Nardo (2004) | HTK | 20 | 1 | 5.00 | Celsior | 20 | 0 | 0.00 | 3.00 | 0.49 | Undefined |
| Brolese (2008) | HTK | 148 | 7 | 4.73 | Celsior | 82 | 0 | 0.00 | 8.36 | 0.14 | Undefined |
| Dondero (2010) | UW | 92 | 4 | 4.35 | IGL-1 | 48 | 1 | 2.08 | 2.09 | 0.51 | Death or retransplantation in days 1–7 |
| Schwartz (1991) | UW | 32 | 1 | 3.13 | Ringers | 34 | 2 | 5.88 | 0.53 | 0.60 | Undefined |
| Adam (1991) | Albumin | 42 | 1 | 2.38 | Ringers | 41 | 3 | 7.32 | 0.34 | 0.34 | Undefined |
| Sanchez-Urdazpal (1993) | Plasmalyte | 20 | 0 | 0.00 | Carolina rinse | 23 | 0 | 0.00 | 1.14 | 0.95 | Undefined |
| Bachmann (1997) | Albumin | 10 | 0 | 0.00 | Carolina rinse | 10 | 0 | 0.00 | 1.00 | 1.00 | Undefined |

Studies are grouped by preservation solutions compared.
N indicates number in group; n, number with primary nonfunction; RR, relative risk of primary nonfunction, solution 1 versus solution 2.

**Conclusions:** Data from included studies suggest that preservation of deceased donor livers with the University of Wisconsin or Celsior solution results in equivalent outcomes.

# EUROPEAN LIVER TRANSPLANT REGISTRY

## 28 countries - 155 institutions

## 118,441 transplantations - 106,849 patients

## From May 1968 to December 2013

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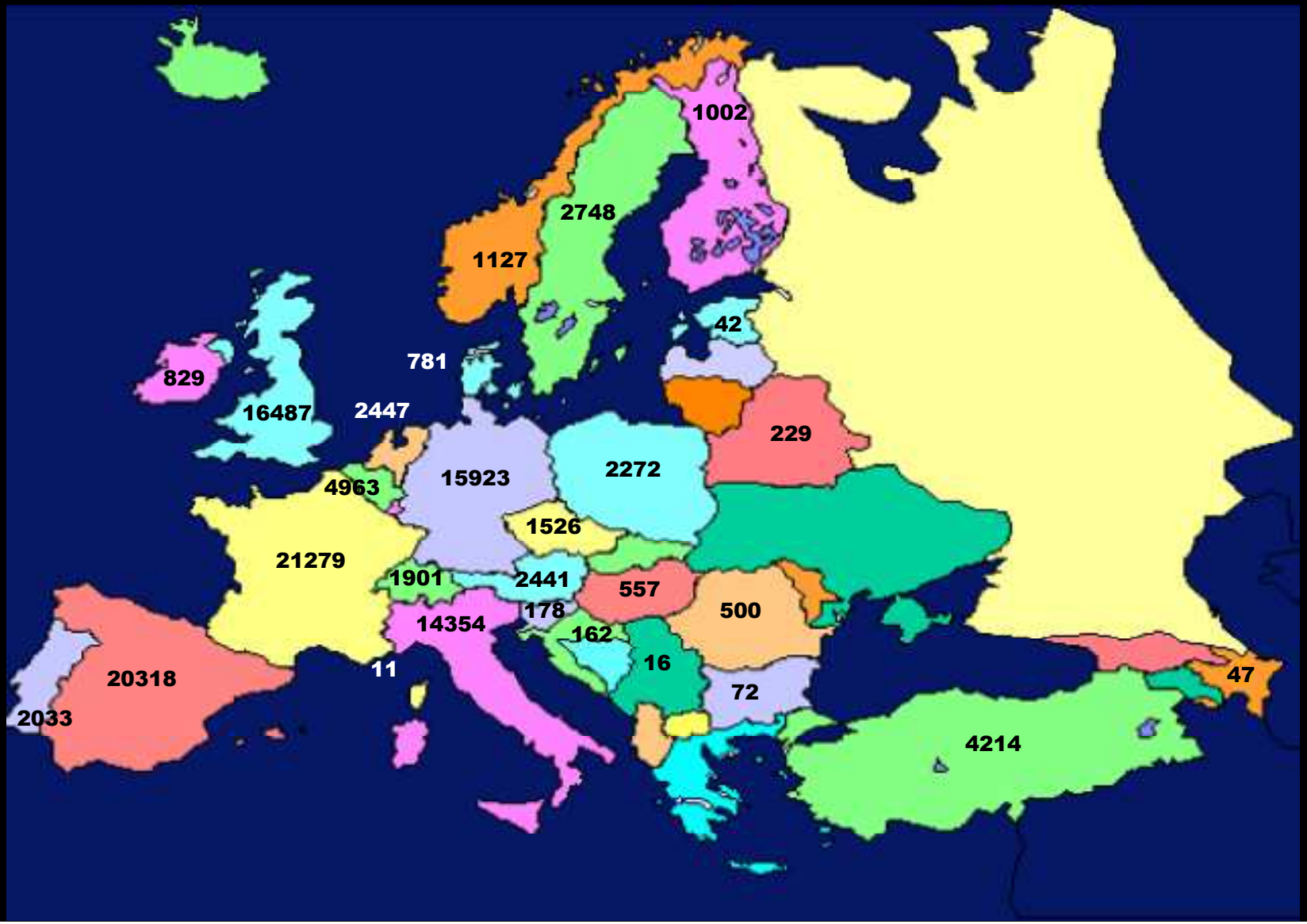

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# LIVER PRESERVATION IN EUROPE

Aim of the study : To compare the results of the preservation solutions used in Europe regarding Graft Survival

1- Evolution in the use of Preservation solutions

2- Definition of the study population

3- Analysis of the  preservation groups

4- Results of Graft Survival

5- Univariate analysis : Predictive Factors of Survival

6- Multivariate analysis

7- Cause of Graft loss

# Evolution of the use of Preservation Solutions in Europe

## 1983 – 2012, N=95,466

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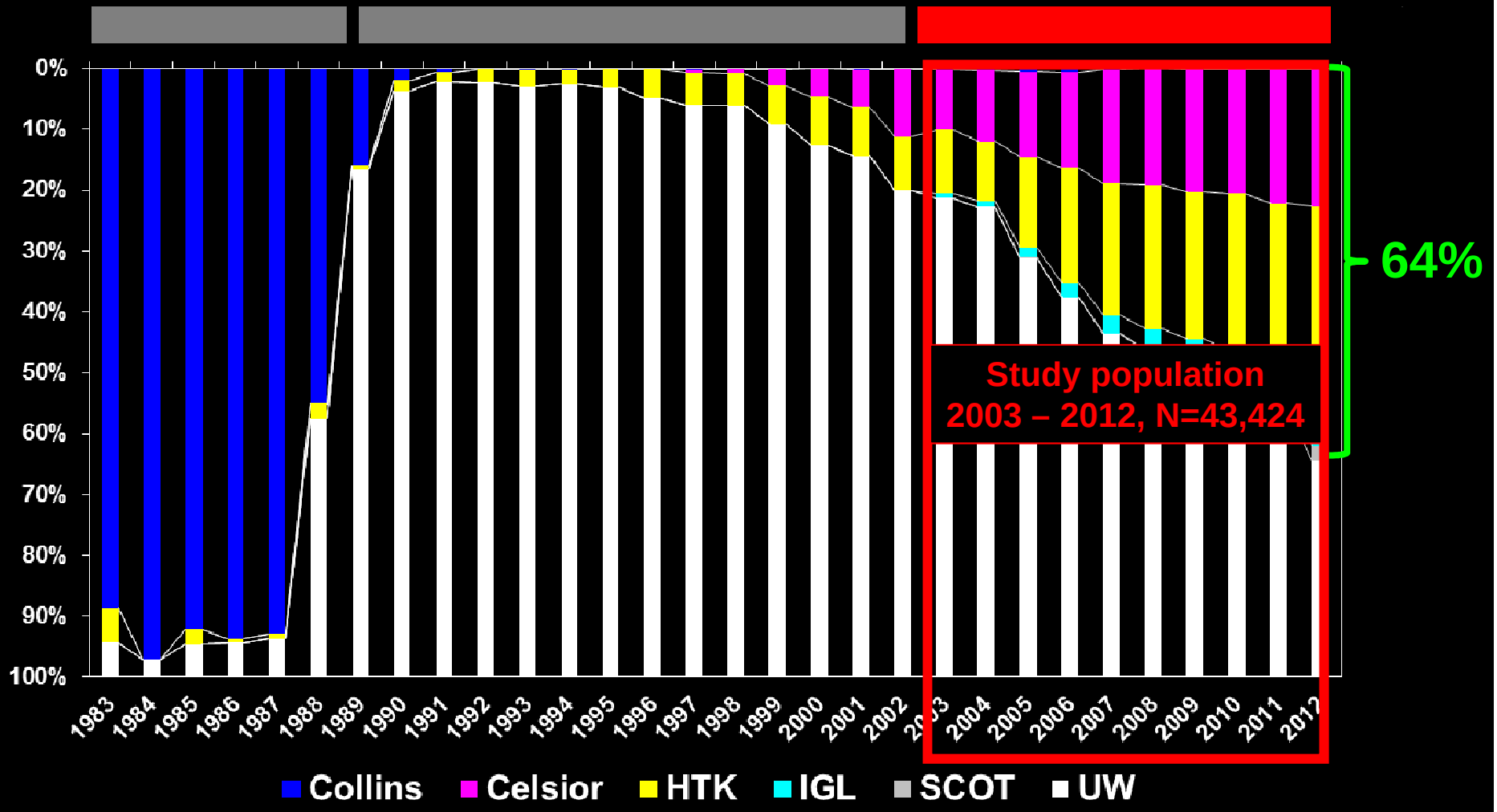

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# Study population

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106,701 1st LT
in adults (≥18 yrs)
1983 - 2012

43,424 1st LT
2003 - 2012

Celsior
(n=7,756)

HTK
(n=8,696)

IGL
(n=1,855)

UW
(n=24,562)

SCOT
(n=123)

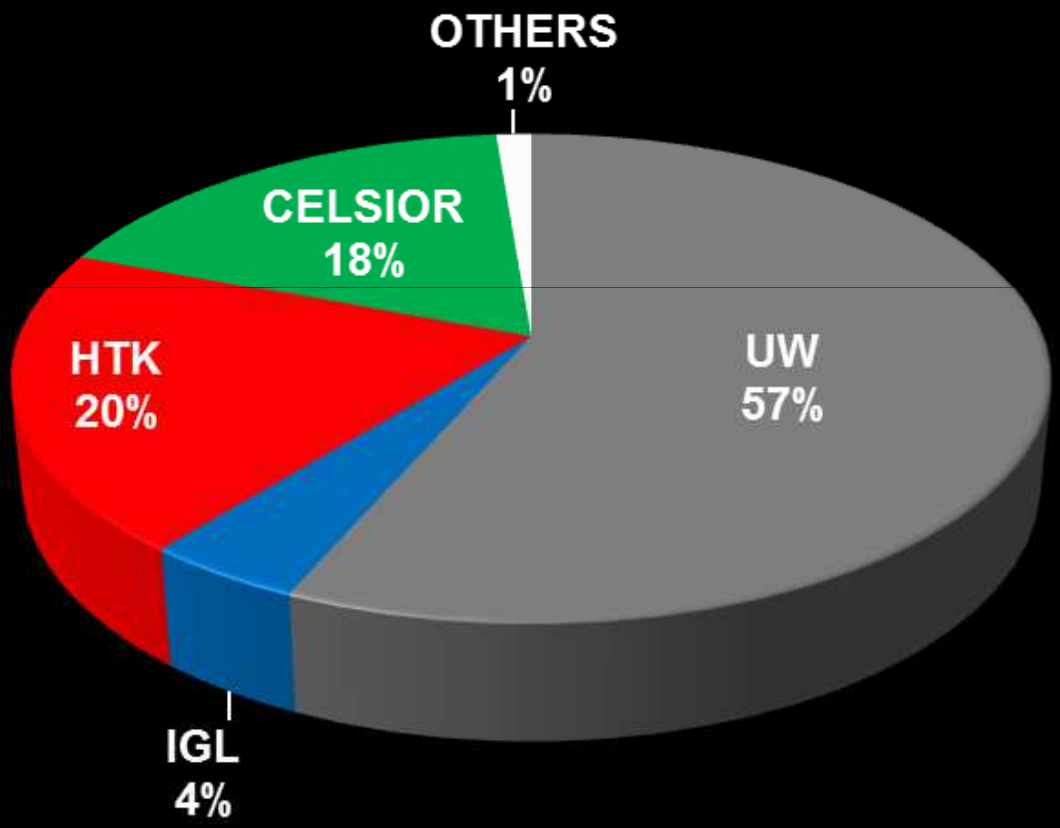
Collins
(n=122)

Others
(n=300)

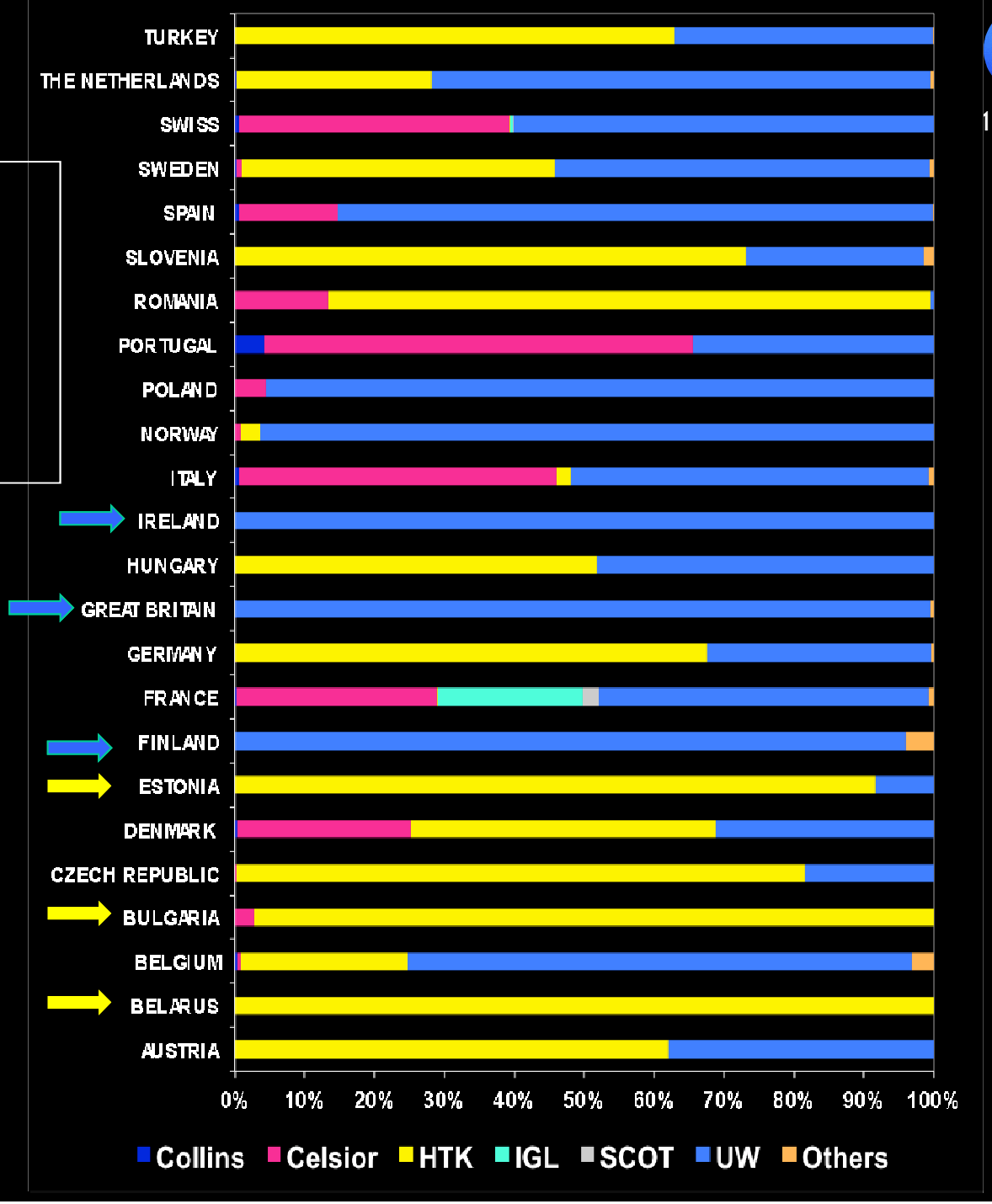
# Use of Preservation Solutions in Europe

## 2003 – 2012, N= 43,424

12/2013



# Use of Preservation Solutions in Europe

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# Demographics Characteristics

| Preservation Solution | Celsior | HTK | IGL-1 | UW | p |
|---|---|---|---|---|---|
| N | 7,756 | 8,696 | 1,855 | 24,562 | |
| **Recipent characteristics** | | | | | |
| Age (year) (mean±sd) | 53±10 | 52±11 | **54±10** | 52±11 | <0.0001 |
| Female (%) | 27% | **34%** | 27% | **33%** | <0.0001 |
| BMI (kg/m$^2$) (mean±sd) | 25.6±6.8 | 26 ± 6.3 | 26.6 ± 18.5 | 26.2 ± 22.4 | 0.21 |
| Disease | | | | | |
| Cirrhosis | **54%** | 60% | 60% | 61% | <0.0001 |
| Cancer | **31%** | 18% | 23% | 17% | <0.0001 |
| FUHE | **4%** | 6% | 6% | 7% | <0.0001 |
| Others | **10%** | 15% | 12% | 15% | <0.0001 |
| MELD score (mean±sd) | 17.1±8.9 | 18 ± 9.2 | **19 ± 10.2** | 17.5 ± 8.7 | <0.0001 |
| INR (mean±sd) | 1.8±1.3 | 1.7 ± 1 | **2.0 ± 1.6** | 1.7 ± 1.5 | <0.0001 |
| Bilirubin (mg/dl) (mean±sd) | **5.5±8.4** | 6.6 ± 9.5 | 6.6 ± 9.5 | 6.2 ± 9 | <0.0001 |
| Creatinin (mg/dl) (mean±sd) | **1.1±0.8** | 1.2 ± 1 | 1.2 ± 1 | 1.2 ± 0.9 | <0.0001 |
| Dialysis | 4.9% | 6.9% | 7.0% | **2.4%** | <0.0001 |
| UNOS status (%) | | | | | |
| ICU-bound | 7% | 8% | **14%** | 9% | <0.0001 |
| Continuous medical care | 16% | **21%** | 13% | 14% | |
| Continuous hospitalization | 56% | 45% | 50% | 48% | |
| At home with normal function | 21% | 26% | 22% | 30% | |
| **Tranplant characteristics** | | | | | |
| Total ischemia time (min) | 457±162 | 464 ± 226 | 477 ± 164 | **500 ± 180** | <0.0001 |
| Urgency (%) | 6% | **11%** | 9% | 9% | <0.0001 |
| Partial liver (split or reduced) (%) | 2.8% | 2.2% | **5%** | 4.5% | <0.001 |
| **Donor Characteristics** | | | | | |
| Age (year) (mean±sd) | 54±18 | 48 ± 17 | **51 ± 18** | 48 ± 17 | <0.0001 |
| Female (%) | 43% | 44% | 43% | 43% | 0.22 |
| Living related | 1.5% | **21.1%** | 2.3% | 2.6% | <0.0001 |

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# Graft survival after LT in All patients
## 2003 – 2012, N= 42,869

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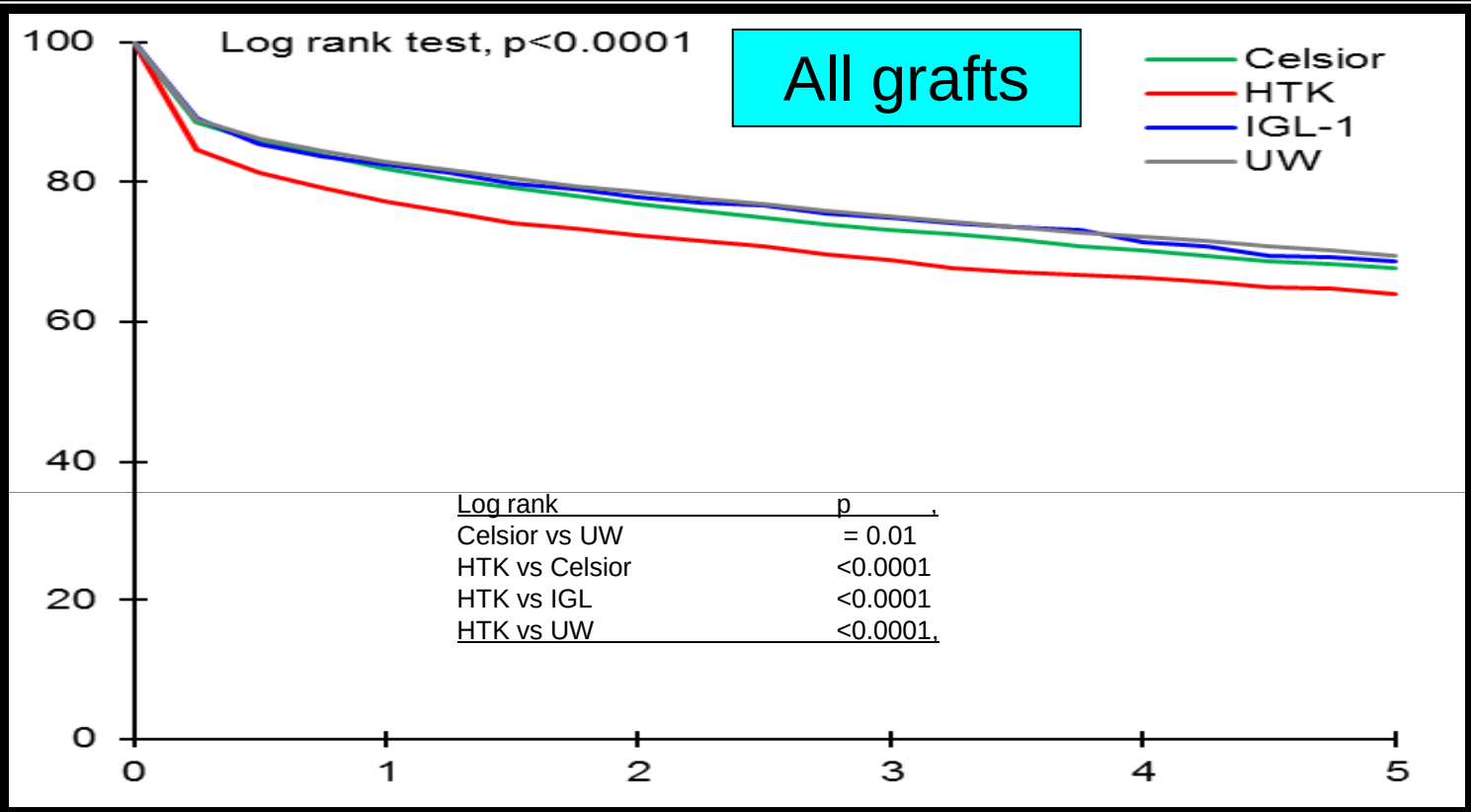


| Log rank | p |
|---|---|
| Celsior vs UW | = 0.01 |
| HTK vs Celsior | <0.0001 |
| HTK vs IGL | <0.0001 |
| HTK vs UW | <0.0001 |

| | 1 yr | 2 yrs | 3 yrs | 4 yrs | 5 yrs |
|---|---|---|---|---|---|
| Celsior | 82% | 77% | 73% | 70% | 68% |
| HTK | 77% | 72% | 69% | 66% | 64% |
| IGL | 82% | 78% | 75% | 71% | 68% |
| UW | 83% | 79% | 75% | 72% | 69% |

| Exposed patients | | | | | |
|---|---|---|---|---|---|
| Celsior | 4,684 | 3,458 | 2,653 | 1,947 | 1,335 |
| HTK | 4,238 | 2,974 | 2,098 | 1,430 | 963 |
| IGL | 1,043 | 717 | 504 | 351 | 225 |
| UW | 16,588 | 13,889 | 11,470 | 9,286 | 7,225 |

# Graft survival after LT in HCC patients

## 2003 – 2012, N= 42,869

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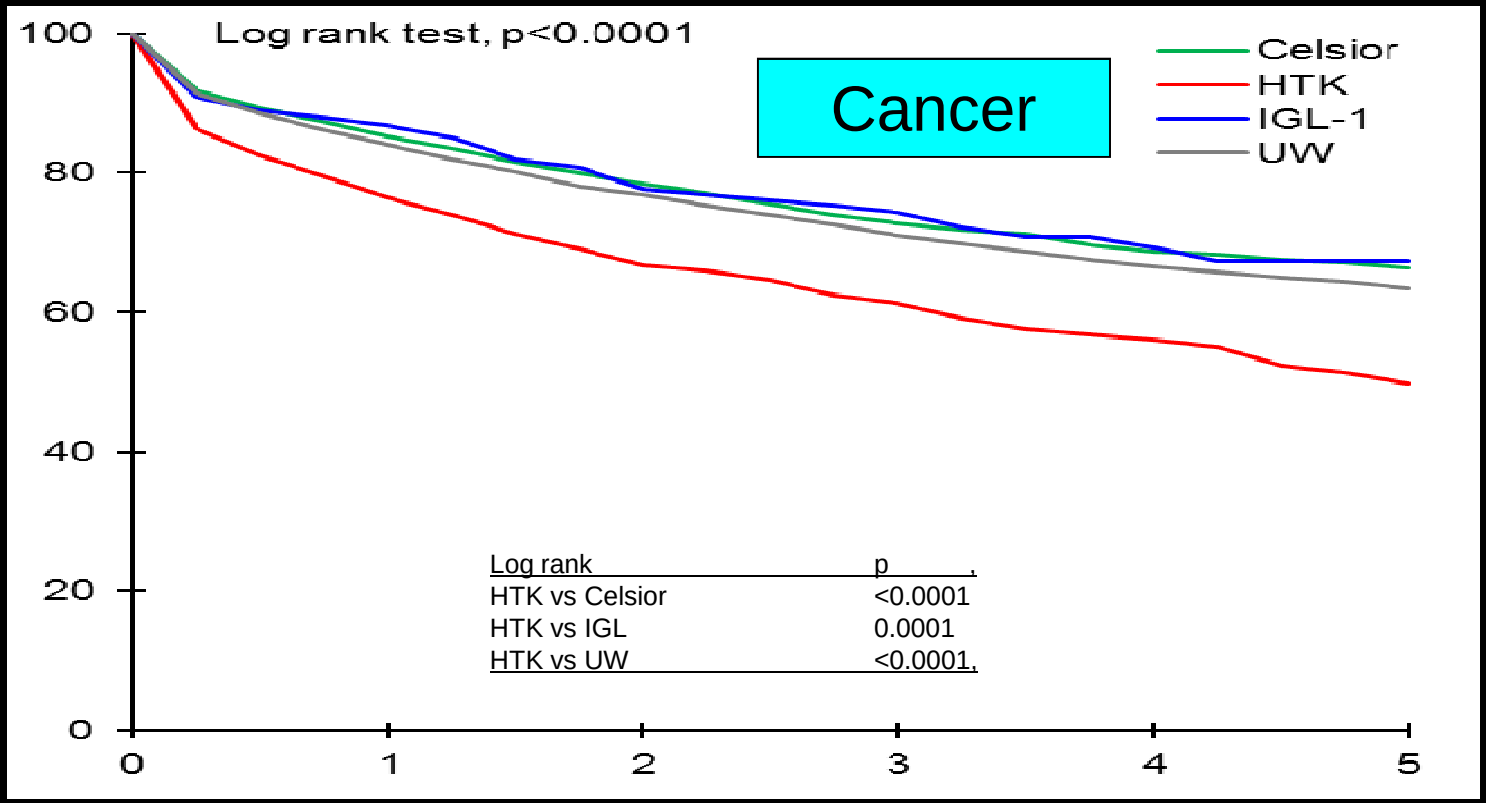


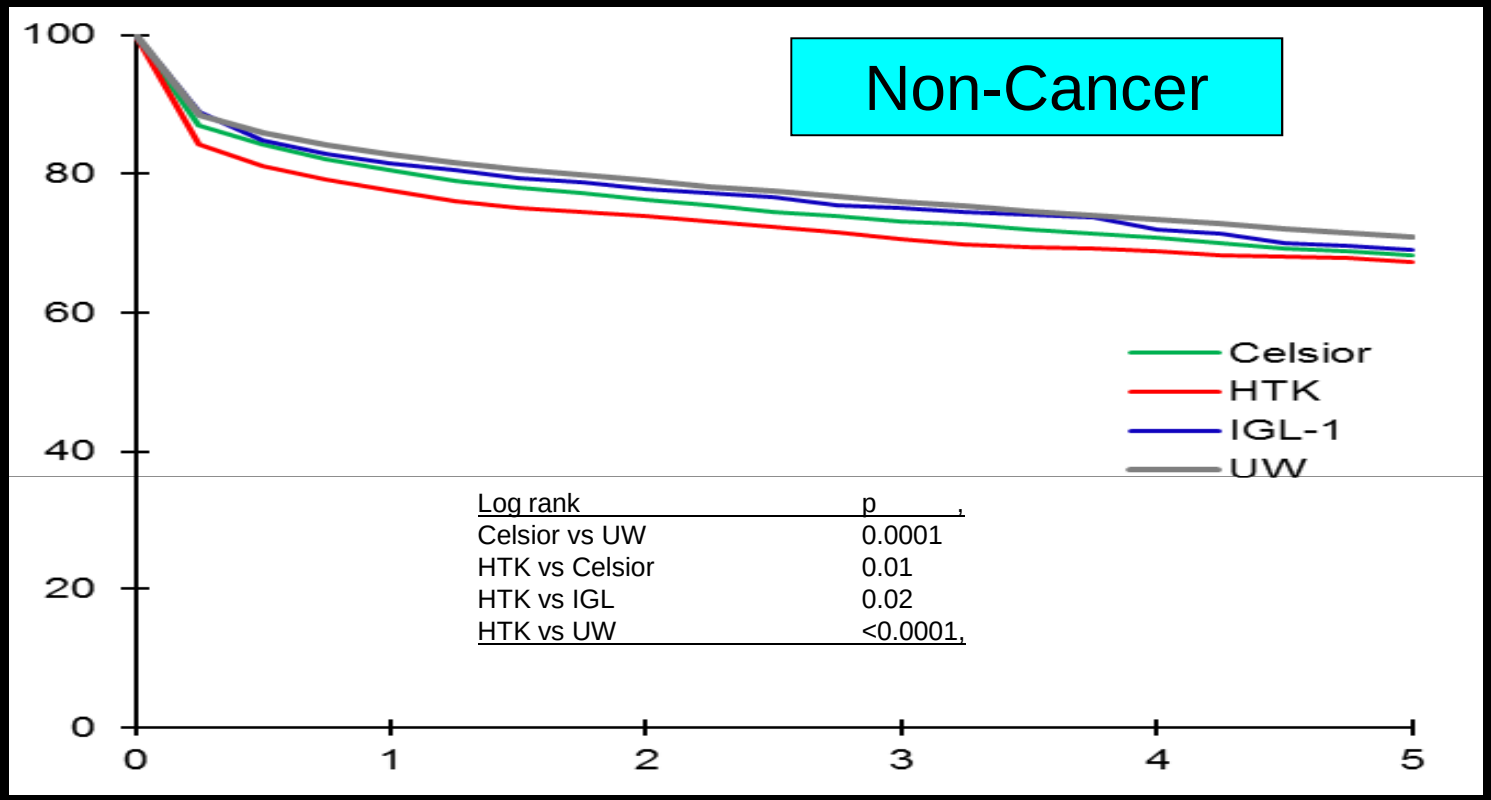

| | 1 yr | 2 yrs | 3 yrs | 4 yrs | 5 yrs |
|---|---|---|---|---|---|
| Celsior | 85% | 78% | 73% | 69% | 66% |
| HTK | 76% | 67% | 61% | 56% | 50% |
| IGL | 87% | 78% | 74% | 69% | 67% |
| UW | 84% | 77% | 71% | 66% | 63% |

| Exposed patients | | | | | |
|---|---|---|---|---|---|
| Celsior | 1481 | 1051 | 759 | 530 | 346 |
| HTK | 777 | 492 | 341 | 214 | 126 |
| IGL | 219 | 116 | 73 | 43 | 20 |
| UW | 2964 | 2379 | 1862 | 1474 | 1100 |

# Graft survival after LT in Non HCC patients

## 2003 – 2012, N= 42,869

12/2013




| Log rank | p |
|---|---|
| Celsior vs UW | 0.0001 |
| HTK vs Celsior | 0.01 |
| HTK vs IGL | 0.02 |
| HTK vs UW | <0.0001, |

| | 1 yr | 2 yrs | 3 yrs | 4 yrs | 5 yrs |
|---|---|---|---|---|---|
| Celsior | 80% | 76% | 73% | 71% | 68% |
| HTK | 77% | 74% | 70% | 69% | 67% |
| IGL | 82% | 78% | 75% | 72% | 69% |
| UW | 83% | 79% | 76% | 73% | 71% |

| Exposed patients | | | | | |
|---|---|---|---|---|---|
| Celsior | 3184 | 2399 | 1886 | 1411 | 988 |
| HTK | 3434 | 2469 | 1748 | 1212 | 835 |
| IGL | 824 | 601 | 431 | 308 | 205 |
| UW | 13532 | 11448 | 9564 | 7778 | 6099, |

# Graft survival after LT in Partial grafts (split or reduced).

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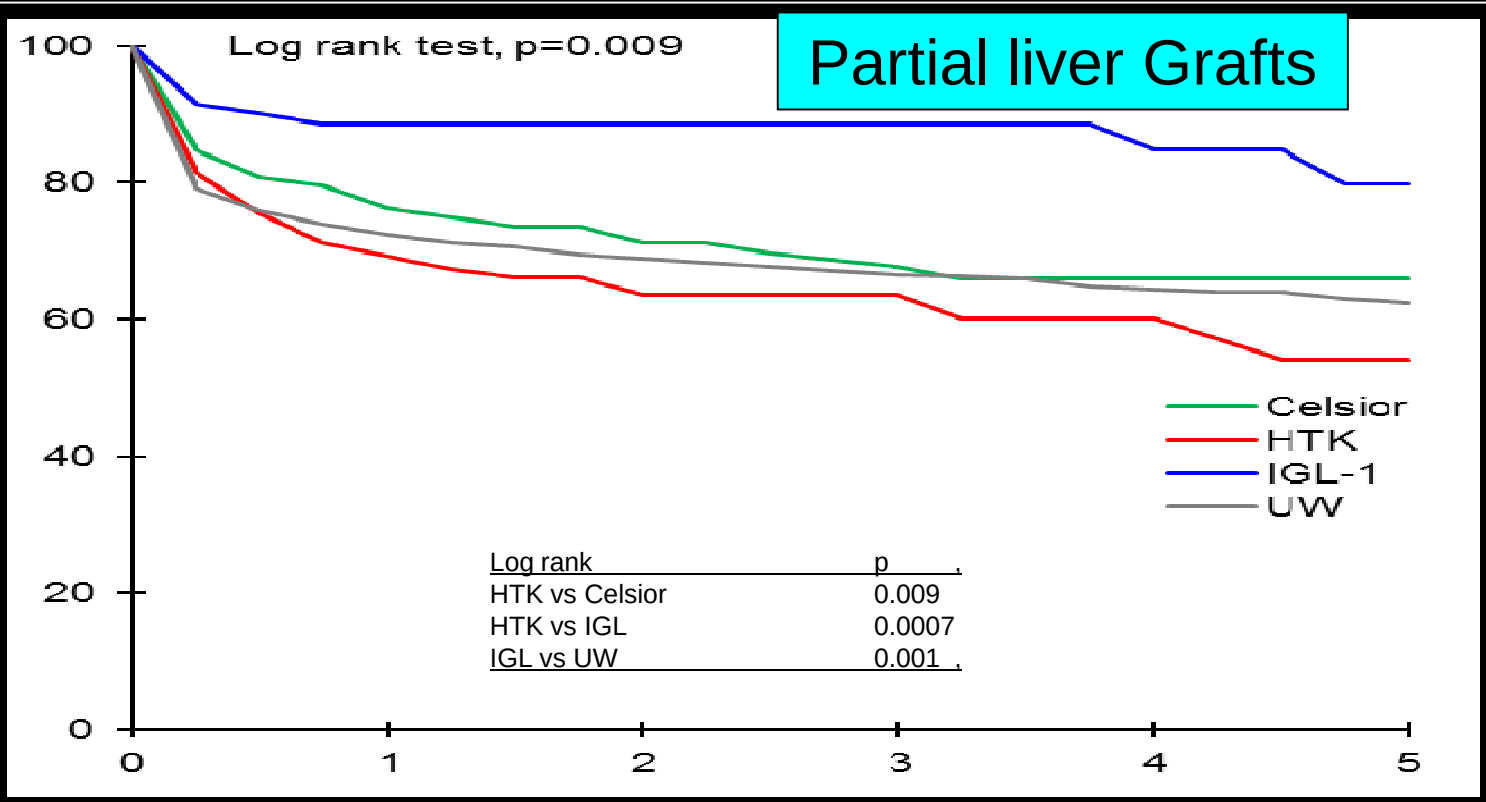


| | 1 yr | 2 yrs | 3 yrs | 4 yrs | 5 yrs |
|---|---|---|---|---|---|
| Celsior | 76% | 71% | 68% | 66% | 66% |
| HTK | 69% | 64% | 64% | 60% | 54% |
| IGL | 89% | 89% | 89% | 85% | 80% |
| UW | 72% | 69% | 67% | 64% | 62% |

| Exposed patients | | | | | |
|---|---|---|---|---|---|
| Celsior | 114 | 92 | 74 | 55 | 33 |
| HTK | 70 | 48 | 37 | 21 | 17 |
| IGL | 55 | 36 | 26 | 22 | 14 |
| UW | 581 | 497 | 431 | 364 | 294 |

# Graft survival after LT excluding LDLT

## 2003 – 2012, N= 42,869

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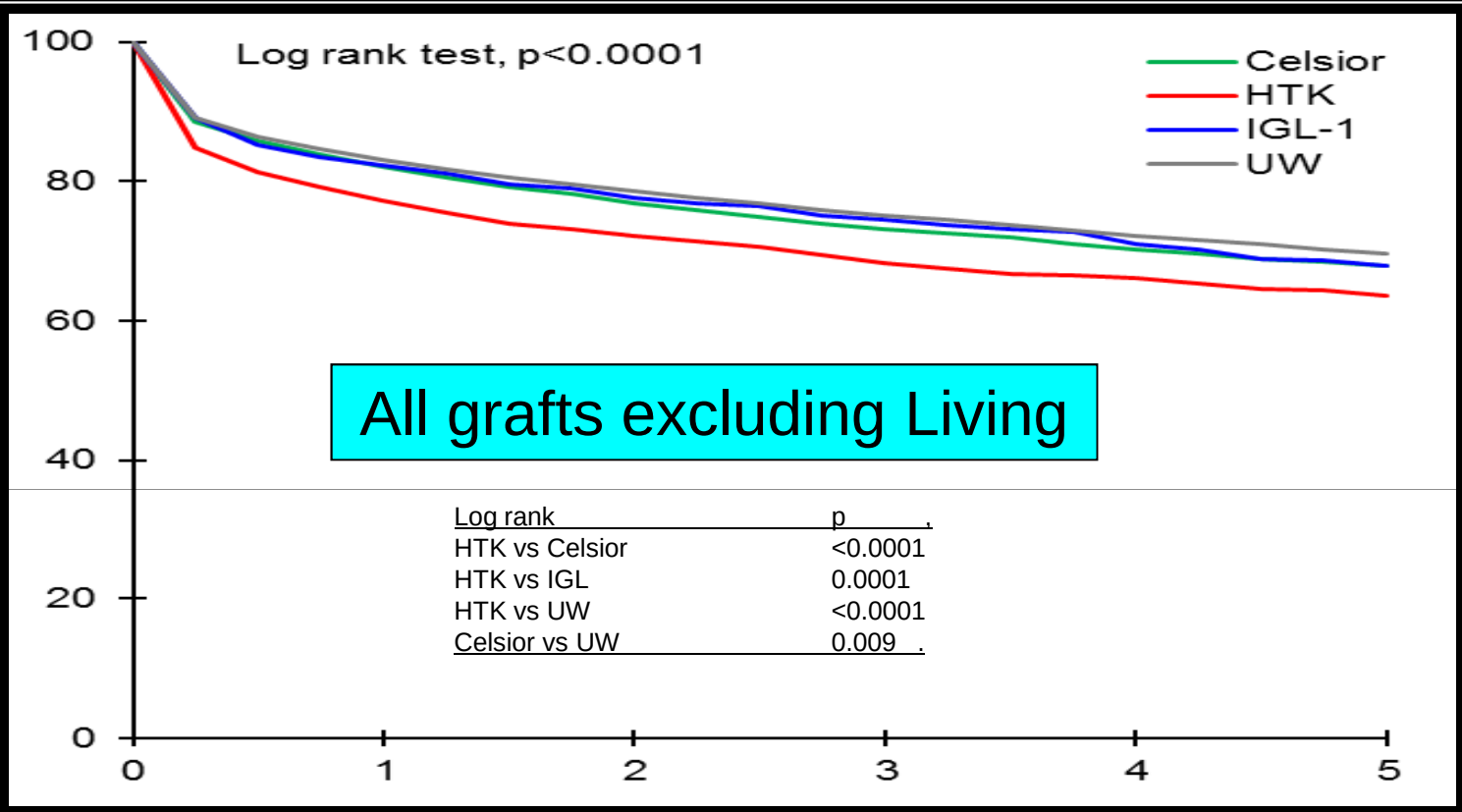


| Log rank | p |
|---|---|
| HTK vs Celsior | <0.0001 |
| HTK vs IGL | 0.0001 |
| HTK vs UW | <0.0001 |
| Celsior vs UW | 0.009 |

| | 1 yr | 2 yrs | 3 yrs | 4 yrs | 5 yrs |
|---|---|---|---|---|---|
| Celsior | 82% | 77% | 73% | 70% | 68% |
| HTK | 77% | 72% | 68% | 66% | 63% |
| IGL | 82% | 77% | 74% | 71% | 68% |
| UW | 83% | 79% | 75% | 72% | 70% |

| Exposed patients | | | | | |
|---|---|---|---|---|---|
| Celsior | 4610 | 3404 | 2604 | 1909 | 1309 |
| HTK | 3464 | 2470 | 1739 | 1160 | 778 |
| IGL | 1012 | 689 | 480 | 329 | 204 |
| UW | 16258 | 13611 | 11245 | 9099 | 7070 |

# Survival according to Ischemia time

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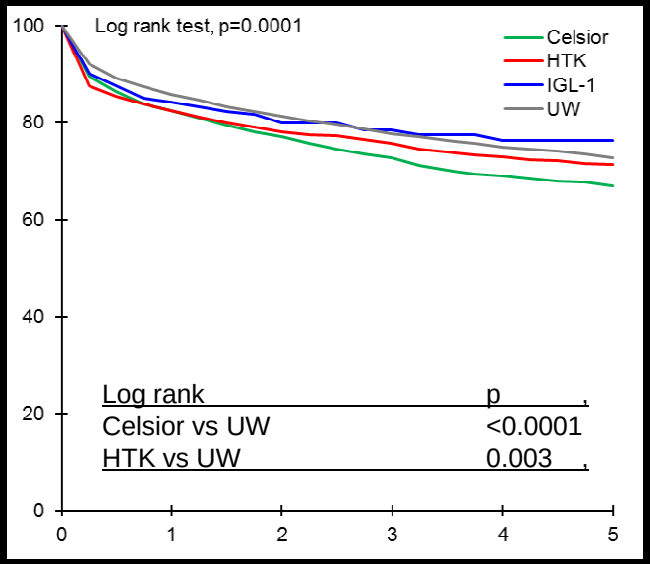
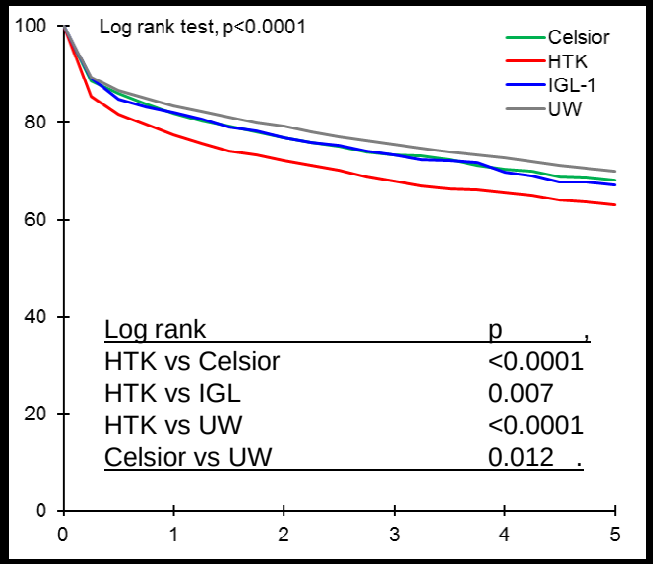
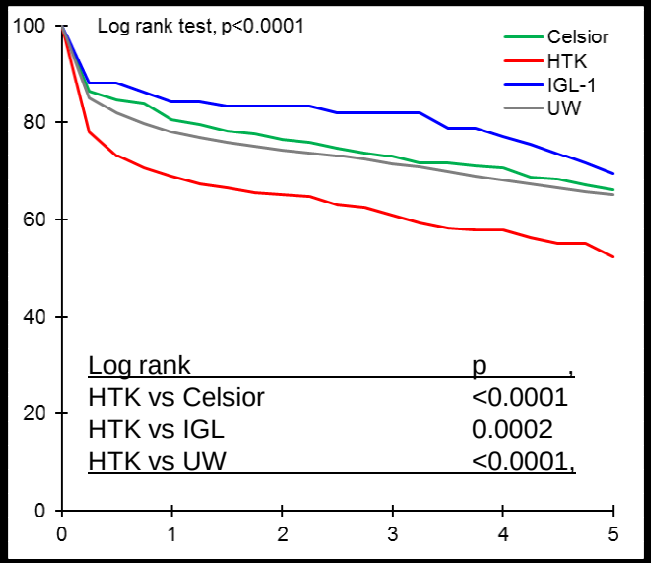
## TIT<6hrs




## 6hrs<TIT<12hrs




## 12hrs<TIT<18hrs



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# Univariate Analysis of Graft Survival

12/2013

| Variable | Option | N | 1 yr | 3 yrs | 5 yrs | 8 yrs | 10 yrs | p |
|---|---|---|---|---|---|---|---|---|
| Recipient age | 15-45 yrs | 9,634 | 83% | 76% | 71% | 66% | 63% | <0.0001 |
| | 45-60 yrs | 22,106 | 82% | 74% | 69% | 62% | 55% | |
| | >=60 yrs | 11,052 | 79% | 70% | 64% | 56% | 49% | |
| Recipient HBs Ag | Negative | 34,441 | 81% | 73% | 68% | 61% | 54% | <0.0001 |
| | Positive | 5,099 | 85% | 79% | 75% | 70% | 68% | |
| Recipient anti HCV | Negative | 28,179 | 83% | 76% | 71% | 65% | 59% | <0.0001 |
| | Positive | 11,161 | 81% | 69% | 62% | 54% | 46% | |
| Recipient HIV | Negative | 31,183 | 82% | 74% | 68% | 61% | 53% | <0.0001 |
| | Positive | 588 | 77% | 64% | 59% | 47% | - | |
| Urgency | No | 33,659 | 82% | 74% | 68% | 62% | 56% | <0.0001 |
| | Yes | 3238 | 72% | 66% | 62% | 59% | 59% | |
| UNOS status* | 1 | 3,307 | 69% | 64% | 61% | 58% | 57% | <0.0001 |
| | 2 | 5,788 | 76% | 69% | 64% | 56% | 52% | |
| | 3 | 18,436 | 83% | 75% | 69% | 63% | 55% | |
| | 4 | 10,242 | 85% | 78% | 72% | 65% | 59% | |
| Preservation Solution | Celsior | 7,749 | 82% | 73% | 68% | 59% | 54% | <0.0001 |
| | HTK | 8,657 | 77% | 69% | 64% | 57% | 56% | |
| | IGL | 1,855 | 82% | 75% | 68% | 66% | - | |
| | UW | 24,531 | 83% | 75% | 69% | 63% | 56% | |

* (1) Intensive care unit-bound, (2) Continuous hospitalization, (3) Continuous medical care, (4) At home with normal function

# Univariate Analysis of Graft Survival
## (continued)

12/2013

| Variable | Option | N | 1 yr | 3 yrs | 5 yrs | 8 yrs | 10 yrs | p |
|---|---|---|---|---|---|---|---|---|
| Ischemia time | [1-6hrs[ | 9,781 | 84% | 76% | 71% | 65% | 64% | <0.0001 |
| | [6-12hrs[ | 26,227 | 82% | 74% | 68% | 61% | 54% | |
| | [12-18hrs[ | 4,065 | 76% | 70% | 63% | 56% | 48% | |
| | [18-36hrs[ | 104 | 78% | 68% | 66% | 66% | 66% | |
| Type of Graft | Cad. Full siz. | 37,428 | 82% | 74% | 69% | 62% | 55% | <0.0001 |
| | Domino | 473 | 81% | 70% | 66% | 45% | 42% | |
| | Living | 2,547 | 79% | 72% | 66% | 61% | 59% | |
| | Reduced | 97 | 68% | 62% | 52% | 52% | - | |
| | Split | 1,483 | 74% | 68% | 64% | 56% | 54% | |
| Main disease | AHF | 2,653 | 72% | 67% | 64% | 60% | 60% | <0.0001 |
| | Cancer | 8,555 | 83% | 70% | 62% | 54% | 46% | |
| | Cirrhosis | 25,333 | 82% | 75% | 69% | 63% | 57% | |
| | Others | 5,829 | 82% | 76% | 72% | 65% | 59% | |
| Donor age >=65yrs | Yes | 8,045 | 80% | 69% | 62% | 54% | 47% | <0.0001 |
| | No | 30,808 | 82% | 75% | 70% | 63% | 57% | |
| ABO Blood group | Compatible | 2,435 | 77% | 70% | 66% | 62% | 58% | <0.0001 |
| | Identical | 39,170 | 82% | 74% | 68% | 62% | 55% | |
| | No identical | 259 | 69% | 62% | 59% | 50% | - | |
| Nb LT center <500 | No | 34,655 | 82% | 74% | 68% | 61% | 56% | 0.008 |
| | Yes | 8,137 | 80% | 72% | 67% | 62% | 52% | |

# Univariate Analysis

12/2013

## Prognostic Factors of Graft Survival

### Recipient

| | |
|---|---|
| - Age | < 0.0001 |
| - HBV Ag - | < 0.0001 |
| - HCV + | < 0.0001 |
| - HIV + | < 0.0001 |
| - Urgency | < 0.0001 |
| - UNOS | < 0.0001 |
| - Cause LT | < 0.0001 |

### Donor

| | |
|---|---|
| - Age | < 0.0001 |
| - ABO Comp. | < 0.0001 |

### Transplantation

| | |
|---|---|
| - Preservation | < 0.0001 |
| - Ischemia time | < 0.0001 |
| - Type of graft | < 0.0001 |
| - Nb LT <500 | < 0.0001 |

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# LIVER PRESERVATION IN EUROPE

Aim of the study : To compare the results of the preservation solutions used in Europe regarding Graft Survival

1- Evolution in the use of Preservation solutions

2- Definition of the study population

3- Analysis of the  preservation groups

4- Results of Graft Survival

5- Univariate analysis : Predictive Factors of Survival

6- Multivariate analysis

7- Cause of Graft loss

# Graft Survival
## Cox model - N= 34,520

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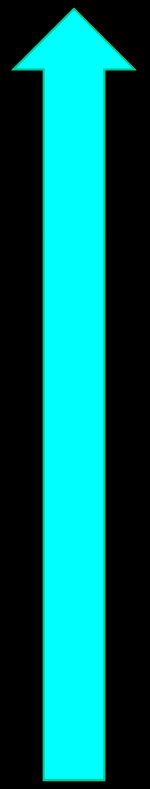
| Risk factors | p | RR | CI 95% |
|---|---|---|---|
| 1. Recipient HIV (+) | <.0001 | 1.50 | [1.29;1.75] |
| 2. Donor age ≥ 65yrs | <.0001 | 1.41 | [1.32;1.51] |
| 3. Recipient anti HCV (+) | <.0001 | 1.40 | [1.34;1.47] |
| 4. Main disease: ACHF | <.0001 | 1.34 | [1.22;1.47] |
| 5. Partial Liver Graft | <.0001 | 1.30 | [1.16;1.44] |
| 6. Recipient Age ≥ 60yrs | <.0001 | 1.29 | [1.23;1.37] |
| 7. Non ABO Isogroup | <.0001 | 1.24 | [1.14;1.34] |
| 8. Recipient HBs Ag (-) | <.0001 | 1.24 | [1.15;1.33] |
| 9. Ischemia time ≥ 12 hrs | <.0001 | 1.19 | [1.11;1.27] |
| 10. Recipient Male | <.0001 | 1.10 | [1.05;1.15] |
| 11. HTK solution | 0.02 | 1.10 | [1.01;1.20] |
| 12. Main disease: not cirrhosis | 0.01 | 1.09 | [1.04;1.10] |



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# Cause of Death or Graft loss
## 2003 – 2012, N=42,869

12/2013

| Preservation Solution | Celsior | HTK | IGL | UW | P |
|---|---|---|---|---|---|
| N | 7,756 | 8,696 | 1,855 | 24,562 | |
| Infection | 12.9 % | 19.8 % | 16.9 % | 13.3 % | <0.0001 |
| Vascular | 8.7 % | 5.9 % | 4.9 % | 9.1 % | <0.0001 |
| Non tumoral reccurence | 13.8 % | 4.6 % | 9.8 % | 11.8 % | <0.0001 |
| Intaoperative death | 2.1 % | 1.7 % | 0.6 % | 1.8 % | NS |
| Tumoral reccurence | 8.1 % | 10.5 % | 3.7 % | 9.6 % | 0.0004 |
| Others | 6.8 % | 6.5 % | 8.3 % | 7.2 % | NS |
| PNF or Dysfunction | 8.3 % | 13.7 % | 7.7 % | 7.1 % | <0.0001 |
| Cardiovascular | 5.6 % | 7.1 % | 7.9 % | 5.8 % | NS |
| Tumor de novo | 4.5 % | 3.0 % | 5.5 % | 7.6 % | <0.0001 |
| Rejection | 4.0 % | 2.3 % | 3.4 % | 4.7 % | 0.0001 |
| Biliary | 2.8 % | 6.0 % | 3.1 % | 4.2 % | <0.0001 |
| Pulmonary | 4.9 % | 3.5 % | 4.0 % | 3.9 % | NS |
| Other hepatic | 3.4 % | 5.3 % | 3.7 % | 3.5 % | 0.005 |
| Cerebrovascular | 4.2 % | 2.8 % | 3.7 % | 2.8 % | 0.04 |
| GI | 2.7 % | 2.8 % | 1.5 % | 2.2 % | NS |
| Renal | 0.7 % | 1.2 % | 1.0 % | 1.0 % | NS |
| Hemorrhage | 0.8 % | 0.9 % | 3.1 % | 0.5 % | <0.0001 |
| Hepatic infarction | 1.3 % | 0.0 % | 0.6 % | 0.2 % | <0.0001 |

# Conclusion

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1- While exclusively used in the nineties, UW solution is currently used in 36% of liver procurements in Europe

2- The most frequent alternative solutions are HTK, Celsior and IGL with different geographic use in relation to countries

3- The best results in terms of graft survival are obtained with UW, IGL and Celsior

4- Total ischemia time ≥ 12h and use of HTK are independent risk factors of graft loss (+19 and +10% respectively)

5- PNF and Graft Dysfunction are significantly more frequently involved in Graft Loss after HTK compared to the other solutions

***Adam et al, Am J Transplantation 2014 (in press)***

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# Histidine–Tryptophan–Ketoglutarate (HTK) Is Associated with Reduced Graft Survival in Deceased Donor Livers, Especially Those Donated After Cardiac Death

Z. A. Stewart, A. M. Cameron, A. L. Singer, R. A. Montgomery and D. L. Segev*

American Journal of Transplantation 2009; 9: 286–293

UNOS Database (2004-2008)
HTK (n= 4755) versus UW (n= 12673)

« After adjusting for donors, recipient and graft factors that affect graft survival, HTK preservation was associated with an increased risk of graft loss (HR 1.44, p= 0.002) especially with DCD allografts and those with cold ischemia time over 8 hours…
Furthermore HTK preservation was associated with a 1.2-fold higher odds of early (< 30 days) graft loss compared to UW »

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# The ELTR thanks the 153 contributing centers…

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