Impact of donor age over 70 years in donation after circulatory death transplantation : 15 years of experience

C. Amicone, D. Ledoux, N. Meurisse, P. Honoré, M. Vandermeulen, MH. Delbouille, J. Monard, A. Warmoes, O. Warling, A. Lamproye, A Kaba, J Joris, J. Delwaide, O. Detry

Introduction

- The disparity between the limited number of donor organs and the number of patients referred for liver transplantation (LT) is associated with significant mortality on the waiting list (1).
- In response to this severe shortage, extended criteria donors such as donation after circulatory death (DCD 3) donors have been proposed as a means to increase the pool of hepatic grafts despite a higher risk of primary non-function (PNF) and ischemic cholangiopathy (IC), particularly in donors above 50 years (2-3).
- In this study, we evaluated the results after DCD 3 LT using grafts from donors over 70 years compared to younger grafts (<70 years) particularly on graft survival and the rate of post-transplant biliary complications.

Methods

- All consecutive DCD 3 LT performed between January 2003 and November 2020 were studied retrospectively (n=228) comparing donors ≥70 years (n=53) and <70 years (n=175)
- All procurement performed according with super rapid recovery technique in OR
- Liver grafts were allocated according to the Eurotransplant organization rules for Belgium (center-oriented allocation)
- Follow-up was completed until 1st January 2022, allowing a minimum follow-up of 1 year for every patient
- The two age groups were compared in terms of graft and patient survivals at 1, 3 and 5 years, in terms of donor and recipient demographics, transplant conditions and laboratory values.

.

Results

- The overall median age of the recipients was 57 years (p=0,0352)
- 49 of the recipients were women.
- The median laboratory MELD score at transplantation was 16
- The primary indication for liver transplantation was decompensated cirrhosis in 151 patients

Recipient variables	Overall (n=228)	Donor age<70 years (n=175)	Donor age≥70 years (n=53)	p-value
Recipient age, years	57.6 ± 10.7	56.8 ± 11.2	60.3 ± 8.3	0.0352
Sex ratio (M : F)	179 (79%) - 49 (21%)	137 (78%) - 38 (22%)	42 (79%) - 11 (21%)	0.882
Recipient laboratory MELD, points	16.6 ± 8.0	16.7 ± 8.2	16.2 ± 7.3	0.8175
Underlying liver -HCC in cirrhotic liver -Other cancer -Cirrhosis without cancer -Retransplant for HAT	 68 7 151 2	 49 6 118 2	 19 1 33 0	

Table 1: Characteristics of the graft recipients; Values are median (i.q.r.). MELD, Model for End-stage Liver Disease; HCC, hepatocellular carcinoma.

Results

- DCD donors had a median age of 56 years (p=0,001)
- The time of cold ischemia was significatively lower in the older group (mean 235 min; SD 72) than in younger donor (mean 258 min; SD 72) (p=0.012).

Donor and graft variables	Overall (n=228)	Donor age<70 years (n=175)	Donor age≥70 years (n=53)	p-value
Donor age (years)	56.5 ± 15.7	50.8 ± 13.4	75.1 ± 4.2	0.0001
Sex ratio (M : F)	141 (62%) - 87 (38%)	107 (61%) - 68 (39%)	34 (64%) - 19 (36%)	0.693
Donor BMI (kg/m2)	26.01 ± 10.5	25.9 ± 11.6	26.4 ± 5.3	0.2435
Donor ICU stays (days)	9.1 ± 8.6	9.4 ± 9.3	8.3 ± 5.7	0.9397
Donor total warm ischemia (min)	19.4 ± 6.9	19.3 ± 6.8	19.9 ± 7.2	0.5178
Donor asystolic warm ischemia (min)	9.0 ± 2.6	8.9 ± 2.4	9.5 ± 3.2	0.0454
Cold storage (min)	253 ± 72	259 ± 72	235 ± 68	0.0120
Cause of death Anoxia (n /%) Trauma (n/%) Stroke (n/%) Neuro Other (n%) Euthanasia (n/%) Other (%)	 Anoxia : 128 (56%) Trauma : 37 (16%) Stroke : 51 (23%) Neuro other : 3 (1%) Euthanasia : 6 (3%) Other : 3 (1%)	 Anoxia : 104 (59%) Trauma : 27 (16%) Stroke : 33 (19%) Neuro other : 3 (2%) Euthanasia : 6 (3%) Other : 2 (1%)	 Anoxia : 24 (45%) Trauma : 10 (19%) Stroke : 18 (34%) Neuro other : 0 (0%) Euthanasia : 0 (0%) Other : 1 (2%)	0.118
Donor Risk Index	2.27 ± 0.42	2.14 ± 0.40	2.67 ± 0.24	0.0001
Donor AST	57.2 ± 49.9	58.9 ± 53.7	52.6 ± 34.2	0.6704

Table 2. Baseline characteristics of donors. Values are median (i.q.r.). BMI: Body Mass Index

- No difference was noted in incidence of acute rejection, biliary strictures, hepatic artery thrombosis or retransplantation rates between the two groups

	Donor <70 years (n=175)	Donor> 70 years (n=53)	P-value
Biliary complications (n,%) Fistula Anastomotic stricture NAS Graft loss due to NAS	 Bilary fistula : 9 (5.1%) Anast strict: 20 (11.4%) NAS 8/175 (4,6%) Graft loss due to NAS :0	 Bilary fistula : 4 (7.6%) Anast strict: 7 (13.2%) NAS : 1/53 (1,9%) Graft loss due to NAS : 0	 Bilary fistula : 0.508 Anast strict: 0.725 NAS: 0,379
Peak AST (units/l)	1561 ± 2151	2201 ± 2703	0.0404
Peak total bilirubin (mg/dl)	4.45 ± 3.62	5.59 ± 5.18	0.3033
Primary non-function	4/175 (2.3%)	2/53 (3.8%)	0.553
Hepatic artery thrombosis	9/175 (5.1%)	1 (1.9%)	0.311

Table 3. Post-transplant complications in DCD LT; NAS= Non Anastomotic Strictures

- The overall graft survivals at 1, 3 and 5 years were 88, 75, 70 per cent respectively.
- Graft survival rates were not significantly different at 5 years between the two groups (P = 0,536).

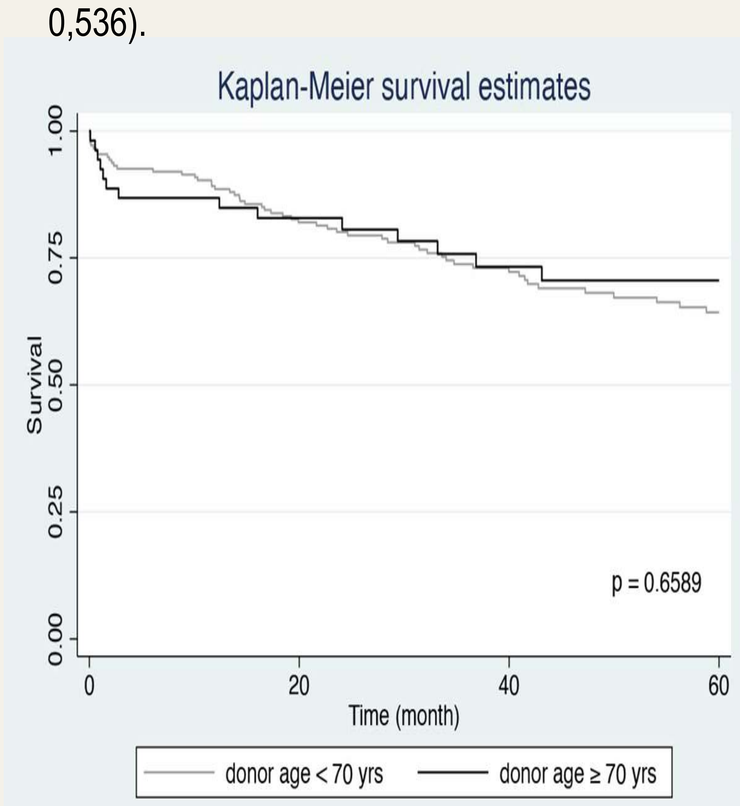

Figure 1:Overall graft survival between the two groups in the donation after circulatory death cohort after 5 years.

Discussion

- This study of a large single centre shows good results for DCD 3 LT, even with grafts from older donors when both donation warm ischaemia and, in particular, cold ischaemia times are kept to a minimum
- One of the notable aspects of this study is the shortest cold ischaemia reported so far for DCD liver transplantation (1). From our point of view, it may be the key explanations for the absence of graft loss due to non-anastomotic stricture
- Donor advanced age does not appear to compromise these results, as no difference between acute rejection, biliary strictures, hepatic artery thrombosis or retransplantation was demonstrated between DCD liver grafts from young donors and those from septuagenarian.

Conclusion

- Donor age limit in DCD3 LT remains a challenging issue
- In our study, results for DCD LT from 70-yr-old grafts were similar to those from younger donors.
- Advanced donors is not a risk factor per se for DCD liver transplants and should not be discarded for liver donation if other donor risk factors (such as cold ischemia time and graft quality) are limited

References

1) De Lemos AS, Vagefi PA. Expanding the donor pool in liver transplantation: Extended criteria donors. *Clin Liver Dis* 2013;**2**:156-159.
(2) Jay C, Ladner D, Wang A, Lyuksemburg V, Kang R, Chang Y, et al. A comprehensive risk assessment of mortality following donation after cardiac death liver transplant - an analysis of the national registry. *J Hepatol 2011* Oct;**55**(4):808-13.
(3) Mathur AK, Heimbach J, Steffick DE, Sonnenday CJ, Goodrich NP, Merion RM. Donation after cardiac death liver transplantation: predictors of outcome. *Am J Transplant* 2010;**10**:2512-2519

Acknowledgements

I would like to express my special thanks of gratitude to my colleague, Dr Ledoux, for his help with the statistics. I would like to thank Pr Detry for his help and his careful rereading of the paper.

Contact Information

Amicone Caroline

Address
Avenue de l'Hôpital, 1
(CHU Liège)
4000 Liege

Tel: +04/284.27.41
Email:
Caroline.amicone@chuliege.be