Centenarian Livers: Very Long-Term outcomes of very old grafts

Transplantation Publish Ahead of Print
DOI: 10.1097/TP.0000000000001835

Centenarian Livers: Very Long-Term Outcomes of Very Old Grafts

Mauro Salizzoni[1] M.D., Antonio Amoroso[2] M.D., Francesco Lupo[1] M.D., Renato Romagnoli[1] M.D.

[1] General Surgery 2U, Liver Transplant Center

[2] Regional Transplant Center, Piedmont

AOU Città della Salute e della Scienza di Torino

University of Turin, Italy

Correspondence information:

Renato Romagnoli, M.D.

Molinette Hospital

Corso Bramante 88

10126 Turin, Italy

Phone: 0039 011 6334374

Fax: 0039 011 6336770

E-mail: renato.romagnoli@unito.it

Authorship statement: MS, conceived the study; AA, participated in data analysis; FL, participated in the performance of the study; RR, wrote the paper

Conflicts of interests: The authors declare no conflicts of interest

Financial support: this work was not funded

Ethic Committee statement: due to the retrospective study design, no specific approval was sought from the Ethic Committee; by Italian law, Regional Transplant Centers are the custodians of donor/recipient biomedical data also for research purposes

After a man is dead, the body…is not dissolved or decomposed at once, but may remain for a good while…for the body when shrunk and embalmed, as is the custom in Egypt, may remain almost entire through infinite ages; and even in decay, still there are some portions, such as the bones and ligaments, which are practically indestructible.

(Plato, *Phaedo*, XXIX, 80 c-d)

Even though the ancient Greeks had observed that parts of the human body could remain intact for a long time after death, it was only with the advent of transplant medicine that life after death became possible for solid organs.[1] Focusing on organ lifetime limits, the fact that today donors of all ages are accepted for liver transplantation[2] raises a question about the maximum lifespan of a liver, both in the donor and in the recipient. In this context, the very long-term outcomes of very old grafts, of those which had already breached the 80-year age barrier at the donor death, have not been reported yet.

Our center pioneered the use of liver grafts from very old donors with 26 octogenarian livers being transplanted between 1998 and 2006, and 120 thereafter. Focusing on those 26 organs transplanted more than 10 years ago, we recorded the following actual 5-year and 10-year survival rates: 77% and 69% for the patient, 69% and 62% for the graft. Two patients were re-transplanted early for allograft dysfunction and 1 later in the follow-up for a biliary complication. To date, 15 patients are alive thanks to a liver which is now more than 90, 2 of those organs being centenarian. Centenarian livers were respectively 84 and 86 years old at the time of transplantation and their recipients are currently 66 and 76.

At the time of transplant, those 26 grafts had a median donor risk index[3] of 2.2, had no or mild macrovesicular steatosis (never involving more than 15% of the hepatocytes), and were transplanted with a cold ischemia time always below 11 hours. Recipients had a median age of 59 years, a median Model for End-stage Liver Disease score of 16 and were affected by hepatocellular carcinoma in 35% of the cases (9/26). Concerning the causes for graft loss, 6 livers were lost early due to organ dysfunction and/or infections, 3 suffered from a severe recurrence of hepatitis C and 2 were lost due to tumours (de novo lung cancer and recurrent hepatocellular carcinoma).

Although already satisfactory, these results are expected to improve because the introduction of direct-acting antiviral drugs is cancelling the negative impact of hepatitis C virus reinfection on liver transplant outcomes,[4] and the spreading use of dynamic preservation techniques is holding the promise of reducing ischemia-reperfusion injury in extended criteria grafts.[5]

Overall, our data reinforce the safety of evaluating all donor offers for potential utilization in a liver transplant, irrespective of the donor age, and evidence the uniqueness of the liver as an organ which has life extension potentialities that are still far to be fully appreciated.

References

1. Starzl TE, Marchioro TL, Vonkaulla KN, Hermann G, Brittain RS, Waddell WR. Homotransplantation of the liver in humans. *Surg Gynecol Obstet*. 1963; 117:659-676.

2. Ghinolfi D, De Simone P, Tincani G, Pezzati D, Filipponi F. Beyond the limit: approaching systematic use of nonagenarian donors in liver transplantation. *Transplantation.* 2016; 100(7):e37-e38.

3. Feng S, Goodrich NP, Bragg-Gresham JL, et al. Characteristics associated with liver graft failure: the concept of a donor risk index. *Am J Transplant*. 2006; 6(4):783-790.

4. Felmlee DJ, Coilly A, Chung RT, Samuel D, Baumert TF. New perspectives for preventing hepatitis C virus liver graft infection. *Lancet Infect Dis*. 2016; 16(6):735-745.

5. Westerkamp AC, Karimian N, Matton AP, et al. Oxygenated hypothermic machine perfusion after static cold storage improves hepatobiliary function of extended criteria donor livers. *Transplantation.* 2016; 100(4):825-835.