



Hypothermic machine perfusion after static cold storage to improve renal function of Expanded Criteria Donors: first experience from Nephrology Unit of Bari, Italy

Simona Simone¹, Rossana Franzin¹, Irene Scalerà², Alessandra Stasi¹, Chiara Musajo Somma³, Raffaella Guido³, Annalisa Casanova¹, Adriano Montinaro¹, Michele Rossini¹, Virginia Pronzo¹, Matteo Matera⁴, Pasquale Ditunno⁴, Michele Battaglia⁴, Loreto Gesualdo¹

1 U.O.C. di Nefrologia, Dialisi e Trapianto, DETO, Università degli Studi di Bari, Policlinico, Bari;

2 University of Bari, Department of General Surgery and Liver Transplantation, Policlinico - Piazza Giulio Cesare 11, 70125, Bari, Italy

3 Centro Regionale Trapianti, A.O.U. Policlinico Consorziale di Bari, Piazza Giulio Cesare 11, 70125, Bari, Italy

4 U.O.C. di Urologia, DETO, Università degli Studi di Bari, Policlinico, Bari;

Background

Hypothermic machine perfusion (HMP) is a novel clinical approach to overcome the limitations of traditional static cold storage (SCS) preservation. HMP can be used to assess and recondition Expanded Criteria Donors by improving quality and outcome of kidneys for transplantation. In this study, we reported our first experience with HMP in our Unit of Nephrology by using the system PerKidney (PerLife, Aferetica) device.

METHODS

Kidneys from three marginal donors (age 69, 82, 70 with diabetes and hypertension) were retrieved after 20 ± 15 min of in situ warm ischaemia. Then, kidneys were preserved by 4 ± 2.5 h of SCS, followed by $4 \text{h} \pm 3.5$ of HMP with oxygenated preservation solution (Pump Protect®, Osmolality of 300 mOsm/kg, pH 7.4 potassium 25 mmol/l sodium 100 mmol/l), pressure 35 mmHg and average flow of oxygenation of 1100 ml/min. Renal biopsies and perfusates were collected before and after HMP treatment, the latter immediately before than reperfusion in the recipient. Four kidneys were transplanted by Dual Kidney transplantation (DKT), two kidneys were declared unsuitable for transplant based on Karpinsky score (Sx 7, Dx 6, 82 years donor).

RESULTS

Intrarenal resistance was significantly reduced during the HMP treatment (Vascular Renal Resistance: mmHg/ml/min: T0: 1.58 ± 0.52 , T2: 0.546 ± 0.32 , TEND: 0.320 ± 0.236 , $p < 0.05$), in accordance with improved renal flow (ml/min: T0: 35 ± 15 ; T2: 47 ± 22 ; TEND: 65 ± 23 , $p < 0.05$). Compared to T0, by histological and PAS staining we found a reduced tubular necrosis, dilatation and flattening, reduced PBMCs infiltration and lower detachment of floccule from Bowman capsule after HMP treatments. Donor serum creatinine were respectively 1.1 mg/dL, 0.93 mg/dL and 0.86 mg/dL, BUN 44 mg/dL, 51 mg/dL and 41 mg/dL, with absence of protein at urine exam. Urine output were respectively 5000ml/24h (400 ml/h), 2990 ml/24h (200 ml/2h) and 4550 ml/24h. Serum creatinine in recipients at hospital discharge were 1.24 mg/dL and 1.79 mg/dL and were lower than after SCS as retrospectively compared by similar ECD donors with same age, sex, time of warm and cold ischemia and comorbidities. The two recipients never needed dialysis. Furthermore, by ELISA assay, the detected IL-6 and MCP-1 levels in perfusates were significantly reduced from T0 to TEND (for IL-6: T0: 55, 86 ± 25 , 78 pg/ml, TEND: 8, 85 ± 5.6 pg/ml, $p < 0.05$).

CONCLUSION

HMP treatment resulted in an **improved vascular resistance** and **renal blood flow** using kidneys from expanded criteria donors, with **reduced histological damage and cytokines levels** in the perfusates. Using machine perfusion is safe; no adverse surgical events occurred during the procedure and lower creatinine at hospital discharge was observed.