Poster Session 11: Transplantation and Vascular Surgery
June 30, 2015, 0715-0845

MP-11.01
Hydrogen sulfide treatment mitigates early renal allograft injury and promotes a regenerative phenotype during allogeneic renal transplantation

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Introduction and Objectives: Organ procurement is inherently associated with ischemia-reperfusion injury (IRI), resulting from loss and subsequent restoration of blood flow, which is detrimental to short- and long-term graft function and survival. Treatment of donor organs with small molecules such as hydrogen sulfide (H_2S) is a novel method of mitigating IRI during transplantation. We postulated that H_2S treatment during cold storage could mitigate IRI-induced renal allograft injury following allogeneic renal transplantation (RTx).

Methods: Following bilateral native nephrectomy, recipient Lewis rats underwent RTx with kidneys obtained from Brown Norway donor rats that were flushed with either University of Wisconsin preservation solution (UW group) or UW + 150 μM NaHS (H_2S group) and stored for 6 hours at 4°C in the same solution. Renal grafts were obtained at post-operative (PO) day 2 for histological and RNA microarray analysis.

Results: Upon histological analysis H_2S treated allografts exhibited significantly decreased ($p<0.05$) levels of necrosis and apoptosis at PO day 2 compared to UW. Immunohistochemical staining revealed significantly increased ($p<0.05$) expression of the renal injury biomarker, kidney injury molecule 1 (KIM-1), in UW allografts at PO day 2 compared to H_2S. Upon microarray analysis the most highly upregulated genes in H_2S treated allografts were those involved in cellular proliferation, many of which were significantly increased ($p<0.05$) compared to UW. The most highly upregulated genes in UW treated allografts were those involved in cellular response to stress and injury, many of which were significantly increased ($p<0.05$) compared to H_2S.

Conclusions: H_2S appears to mitigate early renal allograft injury associated with cold IRI and promote a regenerative/proliferative phenotype following allogeneic RTx. H_2S treatment could represent a novel and effective method of protecting kidneys during transplantation and improving clinical transplant outcomes.

MP-11.02
First Canadian experience with donation after cardiac death simultaneous pancreas kidney transplants

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Introduction and Objectives: Increasing organ demand has led to the use of organs from donation after cardiac death (DCD) donors in simultaneous pancreas kidney (SPK) transplants. Compared to neurological determination of death (NDD) donors, DCD donor organs have generally been considered of inferior quality due to prolonged hypotension and warm ischemia experienced during procurement. Here, we present the first Canadian experience of SPK transplants using DCD donors.

Methods: A retrospective case series of SPK transplants from 8 DCD and 16 contemporaneous NDD donors performed between 2008 and 2014 was done. All patients received immunosuppression induction with thymoglobulin and were continued with tacrolimus, mycophenolate mofetil and prednisone triple therapy post transplant. Complication rates, serum biochemistries, and patient and graft survivals were compared up to 6 years post transplant.

Results: Donor and recipient characteristics of DCD and NDD groups were similar with respect to age, BMI, kidney and pancreas cold ischemia times, and gender. Mean DCD graft warm ischemia time was 0.5 hours (range 0.4-0.7h). There were 5 (62.5%) cases of renal delayed graft function (DGF) in the DCD group, and none in the NDD group. There were 2 cases of pancreas graft thrombosis in the NDD group, and none in the DCD group. No patients from the DCD group have required insulin at any time post transplant. Estimated glomerular filtration rate (eGFR) was lower in the DCD vs. NDD group on post-operative days 3, 7 and 14 ($P<0.05$), but no differences in eGFR between the groups were noted on days 30 through 4 years post transplant. No differences in amylase or lipase were seen between the groups up to 4 years post transplant. There were no differences in HbA1c to 2 years post transplant. However, HbA1c in patients with functioning pancreas transplants at 3 years was superior in the DCD vs. NDD group (5.3% and 6.0%, respectively ($P=0.0025$)). There were no differences in kidney, pancreas, or patient survival at any time point post-transplant. Median follow-ups were 2.2 years (0.1-6.7) and 2.7 years (0.3-6.3) for DCD and NDD groups, respectively.

Conclusions: Here, we present long-term evidence demonstrating that apart from a higher renal DGF rate, SPK transplants with DCD donors have comparable outcomes to standard NDD donors.

MP-11.03
Concurrent pediatric renal transplantation and native nephrectomy: Lessons learned

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Introduction and Objectives: Native nephrectomy (NN) is rarely performed in patients with end stage renal disease (ESRD) prior to renal transplantation (RT). Preemptive NN may be considered when there is difficult to control hypertension, refractory hematuria, chronic recurrent infections, severe proteinuria, large stone burden or massive polyuria. Concurrent renal transplantation and ipsilateral NN is an even more unusual occurrence, often limited to create space for the allograft in patients with large native kidneys. Herein we present our experience with pediatric cases undergoing concurrent NN and RT.

Methods: Retrospective chart review of all pediatric RT where concurrent NN was performed at a large pediatric referral center over a 10-year period (2004-2014). Parameters evaluated included: etiology of ESRD, surgical approach for nephrectomy, mean age, operative time, source of renal allograft (diseased donor vs. living related, estimated blood loss (EBL) and complications.

Results: Of the 189 renal transplants performed over the 10-year period, 8 (4%) children underwent renal transplantation with concurrent nephrectomy. Data are summarized in Table 1. The mean age for all renal transplants was 11.0±5.0 years vs. 7.3±5.4 (N.S.) years for the children that underwent transplant with concurrent nephrectomy. The mean operative

Table 1. MP-11.03

Patient	Age (yr.)	Allograft source	NxType	Side	Etiology ESRD	Nx Indication	Complications
1	8	DDKT	Lap, trans	R	Neurogenic bladder, spina bifida, reflux nephropathy	HTN	Failed KT, rejection
2	15	LRKT	Lap, retro	L	Reflux nephropathy	Refractory gross hematuria	Transplant ureter obstruction
3	4	LRKT	Open	R	HUS	HTN	None
4	6	DDKT	Open	R	PUV, R UVJO	Chronic pyelonephritis	None
5	2	LNRKT	Open	R	Dysplasia	Polyuria	None
6	6	DDKT	Open	R	Dysplasia	Orthotopic RKT, thrombosed IVC	None
7	2	LRKT	Open	R	PUV, VUR	Recurrent pyelonephritis	None
8	16	DDKT	Open	R	B UPJO, VUR	Failed pyeloplasty, reflux nephropathy	None

time was 371±94 minutes. Mean EBL was 321.3±417.3 mL in all patients who received transplants vs. 266.3±109.4 mL in the patients that underwent transplant with concurrent nephrectomy. Seventy-five percent of the patients were transfused. Of note, 2 patients underwent successful transperitoneal laparoscopic nephrectomies rather than enlarging the incision in order to gain access to the kidney. In 6 patients where this procedure was performed for a medical indication, nephrectomy led to resolution of theses issues.

Conclusions: There are few indications for NN in children with ESRD at the time of RT. In these very selected cases, concurrent ipsilateral nephrectomy can be safely performed with the transplant procedure, effectively addressing medical issues related to the native kidney. Both open and laparoscopic approaches can be employed in such circumstances.

MP-11.04

Intra-arterial nitroglycerin for intraoperative arterial vasospasm during pediatric renal transplantation

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Introduction and Objectives: Intraoperative arterial vasospasm during pediatric renal transplantation is an rare, urgent clinical situation with the potential to result in end-organ ischemia, associated changes in parenchymal turgor and color, diminished flow on ultrasound, and if untreated, subsequent loss of the allograft. We hypothesized that intra-arterial injection of nitroglycerin would reverse intraoperative arterial vasospasm and return proper perfusion to the kidney during this rare yet potentially catastrophic situation.

Methods: A 3-year-old girl with end stage renal disease due to autosomal recessive polycystic kidney disease on peritoneal dialysis underwent deceased donor renal transplantation. After optimal immediate reperfusion and satisfactory hemodynamic parameters, the kidney lost turgor and became mottled in appearance despite adequate hilar arterial and venous waveforms. Two aliquots of 0.8 mL of nitroglycerin solution (0.2 mL of 5 mg/mL nitroglycerin in 9.8 mL of 0.9 NaCl) were injected directly into the renal artery with resultant improvement in perfusion. In a 10-year experience involving 189 pediatric renal transplants, this is the first use of an intra-arterial vasodilator to address peripheral allograft vasospasm.

Results: Nitroglycerin injection resulted in dramatic change in the consistency and appearance of the allograft, which was purple with diminished turgor, and poor Doppler flow, with a minor, transient decrease in systemic arterial blood pressure (100/50 to 60/40 for 6 minutes). An improvement in renal blood flow was demonstrated by ultrasound after the second intra-arterial injection with nitroglycerin. The child experienced satisfactory allograft perfusion on serial post-operative ultrasounds, with prompt decrease in serum creatinine and excellent diuresis.

Conclusions: Although a rare occurrence, vasospasm after successful revascularization can jeopardize perfusion and lead to thrombosis and graft ischemia. Our experience with intravascular nitroglycerin suggests that it is a promising option for intraoperative arterial vasospasm during pediatric renal transplantation, with objective improvement in blood flow and perfusion. Due to the rarity of this event, large prospective randomized trials are unlikely to be performed, thus a growing clinical experience with case series may validate use as part of our surgical armamentarium during difficult intraoperative scenarios.

MP-11.05

The 90 day complication rates of renal transplant in a Canadian centre

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Introduction and Objectives: Renal transplant is considered the gold standard of therapy for end stage renal failure however little is published regarding the post-operative complication rates occurring in this population. The Charlson co-morbidity index (CCI) is a validated system for assessing 10yr mortality in the surgical population, and an increasing CCI has been shown to predict renal graft survival (Dindo et al *Ann Surg* 2004; 240(2):205-13)(Hemmelgarn et al *AJKD* 2003; 7:42(1)). The primary purpose of this study is to quantify and categorize the 90d post-op complications after renal transplant. The secondary objective is to assess whether the CCI of transplant recipients predicts 90d complication rate. We hypothesized that worse CCI would correlate with worse complications based on the Clavien-Dindo (Grosso et al *Transplant Proc* 2012; 44(7):1859-63) complication scale.

Methods: A retrospective analysis of recipients of a renal transplant between 2011-2013 at the University of Alberta Hospital who were age ≥ 18 and receiving nephrology care in our institution were included. A modified CCI (excluding Renal Disease category), age, gender, BMI, and graft type were extracted from the transplant EMR. Complications were determined and scored using the Clavien scale. Descriptive statistics of demographics and complications were calculated. Logistic regression analysis assessed the relationship between CCI, age, gender, BMI and graft type on the occurrence of severe post-operative complications (≥Clavien IIIb).

Results: N = 198; 136 male; mean age = 52 (S.D. = 14); mean BMI = 27.4 (S.D. = 4.8); median CCI = 1. Clavien II or higher complications occurred in 60%. Sixty eight unique complications were identified. The most common complications include blood transfusion (19%), diarrhea (16%), UTI (6%) de novo HTN (4%), ileus (4%), symptomatic perigraft fluid collection (4%). Logistic regression suggests a significant predictive value of CCI (OR=1.70; 95%CI 1.28-2.25).

Conclusions: Renal transplant carries significant risk of 90d post-op complications most specifically blood transfusion. This data can be used

to enhance patient counseling and provides a benchmark for improvement in outcomes. CCI was mildly predictive of grade IIIb+ complications. Prospective study of expanded patient and intraoperative factors is warranted to validate and improve risk assessment.

MP-11.06

Blood product utilization pattern in pediatric renal transplantation: Single institution analysis

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Introduction: In renal transplant engraftment surgeries (RTES), there are no evidence based guidelines as to whether blood products should be routinely available by standard cross matching techniques. Due to a greater focus on costs of blood cross matching as opposed to a type and screen, the limited availability of blood products and potential waste if units are not used, not to mention risks of disease transmission and allograft sensitization, herein we evaluated our practice in order to identify factors that could affect a standardized policy for blood product utilization and availability for pediatric RTES.

Methods: Retrospective chart review of patients who underwent pediatric RTES over a 10 year period in a single major referral center was performed. Variables analyzed included: patient age and weight, pre-operative hemoglobin, donor source (deceased or live), estimated allograft size by ultrasound, estimated intra-operative blood loss (EBL), number of units transfused per case, cross-matched/ transfusion (C:T) ratio, and overall transfusion rate.

Results: RTES was performed in 189 patients during the period of analysis. Males represented 59.78% (n=113) and females, 40.21% (n=76). Of these, 54% (102/189) received blood transfusions. In most cases ≤1 unit of blood was transfused (70.5%). However, the total number of units cross matched was 434 (2.3:1 unit/patient). Average EBL was 265 ml, and C-T ratio was 3.1. On multivariate analysis, pre-operative Hgb <11gm/dl with (sensitivity=72, specificity 61) and EBL were found to be statistically significant with regard to intra-operative blood transfusions. Allograft size, patient age, weight and gender were not significant.

Conclusion: At our center blood transfusions are administered to > 50% of pediatric RTES with the majority receiving ≤1 unit. The number of cross-matched units/transfused units is >3 representing significant cost and potential waste of blood products. In higher risk patients with low pre-operative Hgb and/or where the EBL is expected to be high, standard cross match and blood availability should be considered. Therefore, it seems appropriate to institute a type and screen rather than a routine type and cross protocol for RTES.

MP-11.07

Right versus left laparoscopic donor nephrectomy: Initial 3 year experience from a single centre transplant program

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Introduction: Laparoscopic living donor nephrectomy is the standard of care at high volume renal transplant centres. There is still reticence to harvest the right kidney laparoscopically because of concerns regarding shorter right renal vein length, higher complexity of the dissection and potentially worse renal allograft outcomes and complication rates. We performed a retrospective analysis of our single centre laparoscopic donor nephrectomy series with regard to side harvested and outcomes of both donors and recipients.

Methods: Following ethics approval by the University of Manitoba, we retrospectively reviewed 72 consecutive laparoscopic donor nephrectomies (LDN) between May 2011 and July 2014. There were a total of 144 patients when taking into account the donor and recipient pair. All donor nephrectomies were performed laparoscopically at a single centre by a single surgeon. Donor and recipient demographics, intra-operative data and graft outcomes were assessed comparing right to left donor side and differences analyzed utilizing appropriate statistics.

Results: Of the 72 LDN cases, 56 were left sided and 16 right sided. There was no significant difference in donor demographics, donor estimated blood loss, warm ischemic time, complications and length of stay between right and left LDN groups. Recipient mean serum creatinine levels were equivalent between the right and left laparoscopic donor groups at 0, 1 and 6 weeks post-operatively. Finally, rejection and delayed graft function rates in the recipients were no different whether the transplanted kidney was from a right or a left LDN.

Conclusions: This single centre study shows comparable donor operative parameters and recipient post-operative outcomes in left and right laparoscopic donor nephrectomies. Harvesting the right kidney laparoscopically is safe and does not have a negative impact on donor recovery or long term graft function in the recipient.