Title: Hepatic Response to Cooler Hemodialysis

Trainee Name: Elena Qirjazi MD FRCPC
Supervisor(s): Chris McIntyre MD FRCPC

Structured Abstract:

Background:
Hemodialysis exerts significant hemodynamic effects with widespread consequences on vulnerable vascular beds (such as the heart and brain). Cardiac injury, including myocardial stunning and subclinical myocardial ischemia, appears to be common and associated with significantly increased mortality. The liver has been shown to have preserved blood flow during dialysis due to its dual blood supply. Even so, the liver excretory function is decreased, despite the increase in toxin-rich portal vein flow. Extracorporeal cooling during dialysis has been associated with protective effects on the brain and heart of dialysis patients. The effects of cooler dialysis on liver perfusion, function and endotoximia is unknown.

Objectives:
We are using CT perfusion imaging to examine the effect of cooler dialysate on hepatic blood flow during hemodialysis. These data will be related to systemic liver detoxifying function, cardiac contractility and endotoxin levels.

Methods:
This is a pilot randomized cross-over study, of 20 hemodialysis patients from London Health Sciences Centre, London, Ontario. Subjects are asked to undergo two hemodialysis study sessions – one with standard dialysis temperature (36.5 degrees Celsius), and one with cooler dialysis fluid (35 degrees Celsius; order of the sessions will be randomly allocated). During the study sessions, while on hemodialysis, participants have dynamic contrast-enhanced CT studies of their liver using a 256-slice GE scanner. The images are analyzed by generating arterial and portal time density curves – corresponding to perfusion maps. Furthermore, subjects have non-invasive measurements of liver function (using indocyanine green clearance), echocardiograms, and blood investigations to assess endotoxin levels. The relations between endotoxin levels, liver function, hepatic perfusion during cooler versus standard dialysis will be evaluated.

Preliminary Results:
Enrollment, study sessions and data analysis are currently underway. The average age of the first 10 subjects was 63 years old (range 47-83 years), 60% were male and 80% were caucasian. 70% of these subjects had renal failure from diabetes, hypertension or renovascular disease, and the average dialysis vintage was 47 months (range 9-93 months). Preliminary results revealed that total hepatic blood flow is relatively preserved with both standard and cooler hemodialysate. Even so, a trend of higher increases in portal vein blood flow at peak hemodynamic stress was observed with standard dialysis. Cooler dialysate also revealed a trend toward increased indocyanine green clearance rates, indicating a potential improvement in the liver detoxifying function. Associations between clinical, blood test, spectrophotometry and imaging data is being investigated. We expect that these trends will become more distinct by the end of the study.