Early Plasmapheresis for Severe Hypertriglyceride-Induced Pancreatitis

A Case Report and Review of the Literature

September 24, 2014 - Case Reports and Clinical Pearls

Thomas P. Waring¹, Prashant Grover²

1 University of Connecticut School of Medicine, 2 Saint Francis Hospital and Medical Center


Abstract

Triglycerides are an independent risk factor for adverse cardiovascular events and a potential mediator for pancreatic induced inflammation. We present a case of hypertriglyceride-induced pancreatitis that resolved after plasmapheresis, and review the current literature on plasmapheresis as a treatment for pancreatitis caused by hypertriglyceridemia.

Introduction

Hypertriglyceride induced pancreatitis (HTGP) is a potentially life threatening condition. Without prompt recognition and treatment, moderate to severe pancreatitis can rapidly evolve into pancreatic necrosis and ultimately death.¹ Triglycerides in general account for approximately 18% of total body weight.² Triglycerides (TG) are biologic lipids composed of a glycerol pillar to which three fatty acids are attached. These serve as a foundation to more complex biologic membranes. Normal triglyceride metabolism maintains safe levels less than 150mg/dl. Levels in excess of 1000 mg/dl are a risk factor for the development of pancreatitis.³ The sheer size of these macromolecular particles can impede pancreatic blood flow and produce local acinar ischemia. The disturbance of the acinar structure liberates pancreatic lipase. Pancreatic lipases degrade chylomicrons; the largest of the lipoproteins, producing pro-inflammatory free fatty acids.⁴ This pro-inflammatory state can accelerate pancreatic damage and produce local tissue necrosis.

Clinical Case

We report a case of a 52-year-old male, who presented to the emergency department with a chief complaint of abdominal pain associated with anorexia and nausea of three days duration. He has a past history of diabetes type II, hyperlipidemia, and hypothyroidism. Admission laboratory studies revealed a triglyceride level of 17,200 mg/dl, lipase 7,326 U/L, glucose 537 mg/dl, bicarbonate <5 mmol/L and anion gap of 28. A whole blood aliquot had a grossly milky appearance (Figures 1 and 2).
A CT scan of his abdomen showed peri-pancreatic inflammation without necrosis. He was admitted to the intensive care unit for DKA and pancreatitis. He was placed on an insulin and heparin infusion. A plasmapheresis catheter was placed twelve hours after admission. He received one cycle of plasmapheresis with a resultant decrease in total triglyceride levels of 15,000 mg/dl (Figure 3). His abdominal pain resolved after twenty-four hours. His anion gap normalized and he tolerated a low fat diet.

**Figure 3.** Decline in triglycerides during hospitalization. One cycle of plasmapheresis was initiated within 12 hours of admission, along with insulin and heparin infusions.

**Discussion**

Triglycerides are an independent risk factor for adverse cardiovascular events and a potential mediator for pancreatic induced inflammation.\(^1\) Collectively, diet, genetic variability, diabetes and alcohol intake are the commonest explanations for elevated triglycerides. When glycogen stores reach critical threshold in the liver, circulating glucose is shunted into a fatty synthesis.
pathway. Glucose is converted to acetyl-CoA, thus producing fatty acids. These fatty acids are incorporated into triglyceride molecules and transported from the liver in the form of very-low-density lipoproteins (VLDL), ultimately to be stored in adipose tissue.

Insulin therapy is the mainstay for the reduction of severe triglyceride levels. Insulin induces lipoprotein lipase (LPL) production and LPL is a water soluble enzyme of the lipase gene family. Similarly, enzymes in this genus are the hepatic lipases and endothelial lipases. Lipoprotein lipases are found coupled to the luminal side of the endothelium and its main function is to hydrolyze triglycerides packed into the chylomicron. In one report by Monga et al, the use of an insulin infusion at the outset of known severe hypertriglyceridemia lowered triglycerides by 7,000 mg/dl in ninety-six hour period. Mikhaill et al in 2005 used an insulin drip protocol of three to nine units/hour and continued for four days while keeping the patient euglycemic, and noted a resultant drop in triglycerides by 8,000 mg/dl.

Heparin therapy, although reserved for severe cases of hypertriglyceridemia, has a similar mechanism of action to that of insulin. Heparin promotes release of hepatic lipase and lipoprotein lipases from the endothelial surface of the capillary. In a report by Cole et al, in 2009, the use of a heparin infusion at 600 units/hour resulted in a substantial 6,000 mg/dl reduction in total triglyceride levels over a forty hour period. There has been varying reports on heparin use in severe hypertriglyceridemia. Bolus dose heparin has been used with success to lower triglyceride levels. Ewald et al in 2009 showed that a single session of plasmapheresis can lower triglycerides by 70%. Similarly, Yeh et al reported that a single cycle of plasmapheresis lowered triglycerides by 65% and a second cycle by 80%.

Risks of plasmapheresis are low, although bleeding and trauma at the site of catheter insertion are possible. Hypersensitivity reactions to fresh frozen plasma if used in the exchange have been reported.

Experience with plasmapheresis in acute hypertriglyceride-induced pancreatitis is limited. Most of the experience is limited to case reports and case series and there are no consensus guidelines on optimal therapy. Overall, however, plasmapheresis has been reported safe and effective. It is unclear the number of cycles necessary and the timing in which plasmapheresis should be initiated. It is also unclear if plasmapheresis augments hospital stay and/or mortality. It is clear that insulin and heparin either as mono- or dual therapy can reduce triglycerides substantially. The concomitant use of plasmapheresis is an additional therapy to aid in removal of circulating pro-inflammatory molecules and potentially avoid transition to overt pancreatic necrosis.

References


5. Hokanson JE, Austin MA. Plasma triglyceride level is a risk factor for cardiovascular disease independent of high-density


