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Therapeutic plasma exchange for hypertriglyceridemia induced pancreatitis: A rapid and practical approach

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ABSTRACT

Objectives: Acute hypertriglyceridemia induced pancreatitis (HTP) presents with a more severe clinical course compared to other etiologies of pancreatitis. Therapeutic plasma exchange (TPE) is a potential treatment option for lowering plasma triglycerides and possibly decreasing morbidity and mortality. However, clinical data regarding its effectiveness are limited.
Methods: We retrospectively examined the clinical data and outcomes of 13 consecutive episodes of HTP in which TPE was employed to reduce plasma triglycerides during a 15-month period.
Results: The TPE was initiated at a median of 19 hours from the time of presentation. We performed 1.2–1.5 volume TPEs with 5% albumin as the replacement fluid. After only one TPE procedure, the mean plasma triglycerides values decreased from 2993 mg/dl to 487 mg/dl with a reduction of 84%. All 13 patients survived with a mean length of hospital stay of 9.5 days. There were no complications related to TPE.
Conclusions: One TPE procedure is an effective method for reducing plasma triglycerides and possibly decreases the length of hospital stay in patients admitted with HTP.

1. Introduction

Hypertriglyceridemia induced pancreatitis (HTP) accounts for 2–4% of acute pancreatitis (AP) cases and tends to be more severe than AP caused by other etiologies [1–5]. A possible mechanism of HTP is the hydrolysis of plasma triglycerides (TGs) by pancreatic lipase into free fatty acids that are toxic to the pancreatic endothelium and acinar cells [6].

The standard of care for most patients with HTP includes pancreatic rest, analgesia, and fluid resuscitation [4]. Additionally, infusion of insulin and heparin have been utilized to lower lipid levels [7]. Recently, a few case studies have reported improved clinical outcomes by significantly lowering plasma TGs using techniques such as therapeutic plasma exchange (TPE) [8–11]. The rationale is that by rapidly removing TGs from plasma, there would be less free fatty acids available to further damage the pancreas. Herein, we report the largest case series of the use of TPE for HTP in the United States.

2. Materials and methods

Thirteen consecutive patients receiving TPE for the treatment of acute HTP between January 2014 and March 2015 were included in the study. Pertinent data were collected from the electronic medical records. The diagnosis of acute HTP was made if the patient had TGs >1000 mg/dl and at least 2 of the 3 following diagnostic criteria for acute pancreatitis: abdominal pain, elevated serum lipase (>3 times normal), or characteristic findings on imaging. In addition to TPE, all patients received standard of care for HTP including pancreatic rest, analgesia, fluid resuscitation, and

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insulin infusion (when blood glucose was >150 mg/dl). The time from presentation to TPE was calculated from the first emergency department nurse's note to the start of the procedure. The post-procedure TG values were collected within twelve hours of completion of the procedure.

TPE procedures were performed via peripheral intravenous catheters or central double lumen dialysis type catheter using an Optia apheresis device (Terumo BCT, Denver, CO). Acid citrate dextrose solution was used as the anticoagulant. Twelve of the 13 procedures were 1.5 plasma volume exchanges while one procedure was a 1.2 plasma volume exchange. Five percent albumin was used as the replacement fluid for all the procedures. This study was approved by the Institutional Review Board.

3. Results

3.1. Patient characteristics and clinical course

The demographics of the 13 cases are provided in Table 1. The study included 9 males and 4 females with a mean and median age of 39 ± 10.5 years and 42 years respectively. Nine patients (75%) had type II diabetes, and 4 (33%) patients had a history of alcohol abuse. Bedside Index of Severity in Acute Pancreatitis (BISAP) scores ranged from 1 to 3. Associated complications at presentation included diabetic ketoacidosis (38%), necrotizing pancreatitis (31%), and multiorgan dysfunction (23%). All 13 patients survived with a mean and median length of hospital stay (LOS) of 9.5 ± 6.8 days and 8 days respectively.

3.2. Effectiveness of therapeutic plasma exchange

The mean plasma TGs on presentation was 3358 mg/dl (range from 1455 to >4425 mg/dl, Table 2). Levels greater than 4425 mg/dl were reported as >4425 due to the limit of detection. Five patients (patients 1, 2, 7, 9, and 13) had TGs rechecked after an initial medical intervention and prior to TPE (Table 2). For these 5 patients, the mean TGs at presentation and after initial medical intervention were 3348 mg/dl and 2398 mg/dl respectively (mean reduction

Table 1
Demographic data and clinical course.

Patient	Age (years)	Sex	BISAP	Length of hospital stay (days)
1	18	F	3	22
2	42	M	1	4
3	50	M	1	11
4	39	F	2	3
5*	42	M	1	4
6	60	M	3	23
7	42	M	2	7
8	34	M	2	9
9*	42	M	1	4
10	33	M	1	3
11	35	F	2	11
12	47	M	2	8
13	23	F	3	15

* Same patient who underwent therapeutic plasma exchange on two separate hospital admissions.
F, Female; M, Male; BISAP, Bedside Index of Severity in Acute Pancreatitis.

Table 2
Triglyceride values before and after plasma exchange.

Patient	Triglycerides at presentation (mg/dl)	Other interventions prior to TPE	Triglycerides prior to TPE (mg/dl)[a]	Time between presentation and TPE (hours)	Triglycerides after TPE (mg/dl)	%Reduction[b]	Number of plasma exchange procedures
1	>4425**	Insulin drip, subq heparin, fluids	>4425**	49	817	81.5	1
2	2700	Insulin drip, subq heparin, gemfibrozil, fluids	1158	22	330	71.5	1
3	1455	Insulin drip, subq heparin, fluids	1455	17	341	76.6	1
4	2986	Insulin drip, subq heparin, gemfibrozil, fluids	2986	25	435	85.4	1
5*	>4425**	Insulin drip, subq heparin, fluids	>4425**	15	1410	68.1	1
6	3495	Insulin drip, subq heparin, fenofibrate, fluids	3495	28	107	96.9	4 (1 for pancreatitis, 3 for MODS)
7	2204	Insulin drip, fluids	629	15.5	139	77.9	1
8	2612	Gemfibrozil, Omega3, insulin drip, fluids	2612	20.5	182	93.0	1
9*	2987	Insulin drip, subq heparin, fluids	1355	19	357	73.7	1
10	>4425**	Fluids, subq heparin, gemfibrozil	>4425**	41	416	90.6	1
11	>4425**	Fluids	>4425**	14	339	92.3	1
12	3093	Insulin, fluids	3093	8	323	89.6	1
13	>4425**	Insulin, fluids, subq heparin	>4425**	18	1133	74.4	1

* Same patient who underwent TPE for HTP on two separate hospital admissions.
** For "> 4425", 4425 was used for calculations.
[a] Patients 1,2,7,9, and 13 had their triglycerides rechecked after an initial presentation. For all other patients, "Triglycerides prior to TPE" is identical to "Triglycerides at presentation".
[b] Calculated based on pre- and post-TPE triglyceride values.
TPE, therapeutic plasma exchange; SQH, subcutaneous heparin; MODS, multiorgan dysfunction syndrome.

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