

Effects of Tissue Plasminogen Activator as a Dialysis Catheter Locking Solution

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Introduction

Dual lumen central venous catheters are frequently used for hemodialysis access in both the inpatient and outpatient settings.

Typically, a concentrated heparin solution (5,000units/ml) is instilled into each lumen of the catheter at the conclusion of hemodialysis to prevent thrombosis of the vascular access.

In a previous study by our institution, instilling a 5,000 units/ml concentration of heparin into each lumen of the hemodialysis catheter resulted in significant systemic anticoagulation. Subjects were noted with a rise in the aPTT from a baseline of 28 ± 5 seconds to a value of 126 ± 54 seconds at 15 minutes and 71 ± 50 seconds at 60 minutes after instilling heparin. By 240 minutes, the aPTT had fallen to 33 ± 9 seconds.

Tissue plasminogen activator (t-PA) is used as a dialysis catheter locking solution in place of heparin and to restore patency in thrombosed catheters. The systemic fibrinolytic effects of t-PA under these circumstances are unknown.

Methods

We performed "heparin-free" hemodialysis treatments via a central venous catheter on 10 patients at Allegheny General Hospital.

After completion of hemodialysis, 2 mg of t-PA was instilled into each lumen of the dialysis catheter.

Fibrinogen levels, d-dimer levels, fibrinogen degradation product (FDP) levels, and the euglobulin clot lysis time (ECLT) were measured with a baseline value during the last hour of the dialysis treatment and at 15 minutes and 30 minutes after conclusion of the hemodialysis treatment.

The ECLT is an estimate of the fibrinolytic system function and measures the time for in vitro clot to dissolve in the absence of plasmin inhibitors. Reductions in the ECLT are indicative of increased fibrinolysis.

The record of the subsequent hemodialysis treatment including maximum blood flow, minimum blood flow, and liters processed was reviewed to assess catheter function following t-PA administration. Additionally, any incidences of catheter thrombosis were recorded.

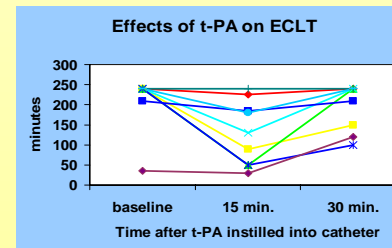
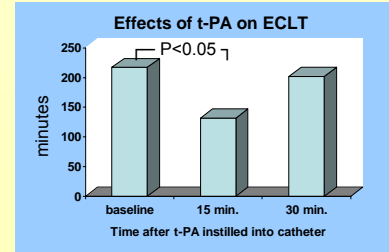
Results

Demographics	
Mean age (yrs)	52 ± 12 (26-70)
Mean weight (kgs)	92 ± 16
Gender	8 males, 2 females
Hemodialysis location	6 inpatients (1 ICU), 4 outpatients
Ethnicity	4 african americans, 6 caucasians

Systemic effects of t-PA

	Baseline	15 min.	30 min.
ECLT(min)	217 ± 64	132 ± 75*	202 ± 56
FDP>20 ug/ml	7/9	7/9	6/9
d-dimers(ug/ml)	10 ± 8	10 ± 9	9 ± 8
Fibrinogen (mg/dl)	434 ± 155	426 ± 152	405 ± 137

*p<0.05 baseline vs. 15 min.



Catheter function during hemodialysis sessions before and after instilling t-PA

	Hemodialysis before t-PA		Hemodialysis after t-PA	
	Mean	Range	Mean	Range
Max. blood flow (ml/min)	450 ± 53	400-500	440 ± 46	400-500
Min. blood flow (ml/min)	418 ± 34	400-500	345 ± 86	250-450
Liters processed	97 ± 26	75-144	102 ± 21	79-144

The FDP, d-dimer and fibrinogen levels in our study subjects were elevated at all time periods but remained unchanged at 15 minutes and 30 minutes after instilling t-PA as compared to baseline levels.

The ECLT at 15 minutes after instilling t-PA was significantly reduced to 132 ± 75 minutes from a baseline of 217 ± 64 minutes. (p=0.016)

At 30 minutes, the ECLT was similar to baseline values.

No episodes of systemic bleeding for study subjects were observed.

No catheter thrombosis events and no significant difference in catheter function during hemodialysis treatments before and after instilling t-PA were noted.

Discussion

t-PA appears to be an effective catheter locking solution with no catheter thrombosis events noted in our study subjects.

The subjects were noted with elevated d-dimer, fibrinogen and FDP levels. However, no difference was noted in these levels after use of t-PA. The exact etiology for the elevated d-dimer, fibrinogen, and FDP levels is uncertain but may represent an increased inflammatory state for these hemodialysis patients.

Despite relatively small doses of t-PA being instilled into the dialysis catheter, an increase in systemic fibrinolysis was noted by a significant decrease in the ECLT at 15 minutes. The decrease in the ECLT was temporary with a return in the ECLT to baseline values at 30 minutes. No clinical signs of bleeding were observed in the study subjects, and the ECLT remained in our laboratory's normal reference range.

The clinical significance of this fibrinolytic effect is uncertain and may warrant further investigation.