

Novel Mechanism for Streptokinase-induced Hypotension in Myocardial Infarction: Retrospective Analyses

Karniza Khalid^{1,2}, Raja Elina Afzan Raja Ahmad¹, Sze Yee Lui³, Alwin Yu Hoong Tong⁴, Ida Zaliza Zainal Abidin³

¹Department of Physiology, University of Malaya, Kuala Lumpur ²Clinical Research Centre, Hospital Tuanku Fauziah, Perlis ³Emergency and Trauma Department, Hospital Tuanku Fauziah, Perlis ⁴Department of Internal Medicine, Hospital Tuanku Fauziah, Perlis

NMRR-19-2871-50953

INTRODUCTION

Therapy with intravenous streptokinase (STK) for patients with acute myocardial infarction is often complicated with hypotension. The aim of the study is to investigate the extent of STK-induced hypotension in the local setting and determine the possible role of alteration in serum protein in the development of this event.

RESULTS

Out of the total 594 medical records screened for eligibility, 412 patients were selected based on the pre-defined criteria. The mean age of the study participants was 59.3 ± 0.66 years old. Majority were male ($n=303$, 82.8%) and of Malay descent ($n=328$, 89.6%). Anterior myocardial infarction was more common compared to the inferior site (50.1% vs. 41.7%).

There were 109 (26.5%) patients who developed STK-induced hypotension whereas 259 (62.9%) with no complication. The yearly prevalence of STK-induced hypotension in our centre ranges from 27.0% to 38.5% ($p=0.435$).

Table 1 showing comparable baseline characteristics and parameters between patients with hypotension and no hypotension.

Variable(s)	Hypotension		No hypotension		p-value
	Mean (SEM)	n (%)	Mean (SEM)	n (%)	
Age ^a	60.6 (1.05)	106 (29.2)	58.7 (0.83)	257 (70.8)	0.158
Gender ^b					0.100
Male		84 (77.8)		219 (84.9)	
Female		24 (22.2)		39 (15.1)	
Race ^c					0.103
Malay		99 (91.6)		229 (88.8)	
Chinese		3 (2.8)		21 (8.1)	
Indian		3 (2.8)		6 (2.3)	
Others		3 (2.8)		2 (0.8)	
Location MI ^d					0.090
Anterior		47 (45.3)		137 (57.6)	
Inferior		52 (54.7)		101 (42.4)	
Baseline CK ^e (U/L)					0.970
Normal (<171)		52 (54.7)		115 (54.5)	
Raised (≥ 171)		43 (45.3)		96 (45.5)	
Baseline Trop-I ^f (ng/ml)	2.0 (0.96)	18 (32.1)	2.3 (1.10)	38 (67.9)	0.329
Baseline TWBC ^g ($\times 10^3/\mu\text{L}$)	10.9 (0.29)	79 (28.3)	10.7 (0.19)	200 (71.7)	0.554
Baseline Hb ^h (g/dL)	13.8 (0.19)	95 (28.5)	14.2 (0.14)	238 (71.5)	0.069
Baseline Plt count ⁱ ($\times 10^3/\mu\text{L}$)	278.7 (6.69)	88 (28.0)	266.40 (4.49)	227 (72.0)	0.140
Baseline Neutrophil count ^j ($\times 10^3/\mu\text{L}$)	7.0 (0.28)	83 (28.2)	6.8 (0.17)	211 (71.8)	0.555
Baseline urea ^k (mmol/L)	6.1 (0.36)	94 (30.7)	5.6 (0.25)	212 (69.3)	0.107
Baseline creatinine ^l ($\mu\text{mol/L}$)	121.2 (7.41)	94 (30.7)	117.9 (6.07)	212 (69.3)	0.142
Baseline Ur/Creat ratio ^m					0.793
Pre-renal		4 (20.0)		6 (15.4)	
Renal		11 (55.0)		25 (64.1)	
Post-renal		5 (25.0)		8 (20.5)	

Note: ^aIndependent t-test; ^bPearson chi-square test of independence; ^cFisher's exact test; ^dMann Whitney U test (presented as median and interquartile range).

Table 2 showing significantly lower albumin level in patients with hypotension following streptokinase therapy.

Variable(s)	Hypotension		No hypotension		p-value
	Mean (SEM)	n	Mean (SEM)	n	
Total protein ^a (g/L)	69.7 (0.91)	44	71.2 (0.58)	103	0.325
Albumin ^a (g/L)	38.3 (0.92)	44	40.0 (0.45)	103	0.015*
Globulin ^b (g/L)	30.4 (1.01)	44	31.2 (0.49)	103	0.452

Note: ^aIndependent t-test; ^bMann Whitney U test (presented as median and interquartile range).

MATERIAL AND METHODS

This is a retrospective cross-sectional study involving data transcription of acute myocardial infarction cases in Hospital Tuanku Fauziah, Perlis from the year 2015 to 2018. Patients requiring prior haemodynamic stabilisation prior to streptokinase administration (i.e. requiring inotropic support or glyceryl trinitrate (GTN) infusion prior to streptokinase), or prior cardiopulmonary resuscitation (CPR) were excluded.

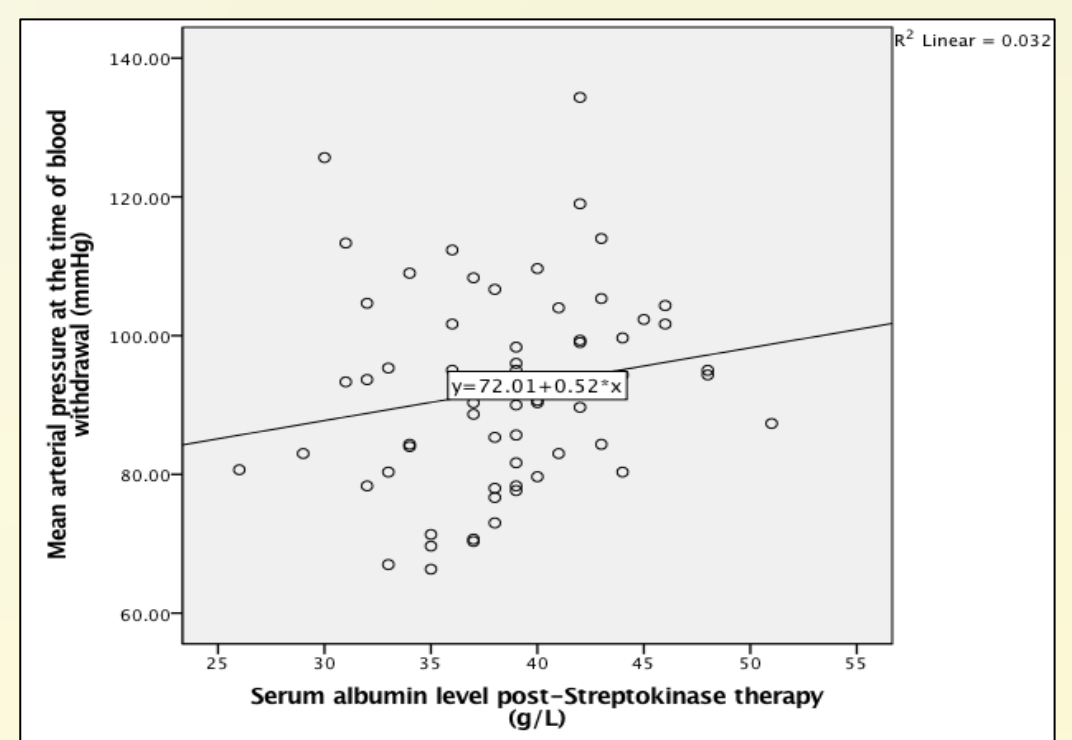


Figure 1 showing significant positive correlation between albumin level and mean arterial pressure in patients with hypotension.

Multiple logistic regression (MLR) showed that **Killip classification** and **baseline heart rate** positively predict the development of hypotension in patients with acute myocardial infarction receiving streptokinase (controlled for age, gender, baseline CK, location of MI, and baseline SBP/DBP).

We found that with every 1 unit decrement of baseline heart rate, the risk of hypotension will increase by 2.6%. Additionally, patients with Killip III and IV have 5 times higher risk of developing STK-induced hypotension as compared to those with Killip I.

DISCUSSION & CONCLUSION

- The yearly prevalence of streptokinase-induced hypotension is similar to other worldwide multicentre studies, ranging from 27.0% to 38.5%.
- Our study suggests streptokinase may have preferential proteolytic activity against serum albumin as patients with hypotension had a significantly lower serum albumin as compared to those without hypotension, following streptokinase therapy.
- The observed reduction in serum albumin level in patients with hypotension may result in reduced serum viscosity, subsequently affects the total peripheral resistance with a resultant drop in blood pressure.
- Therefore, our study suggests the novel role of serum albumin in the pathophysiology of STK-induced hypotension that was never before studied.