

Role of Streptokinase Injection in management of Clotted Hemothorax

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ABSTRACT

Streptokinase (SK) is a thrombolytic medication used to break down clots in cases of myocardial infarction and pulmonary embolism. This study aimed at evaluating the effect of streptokinase as fibrinolytic drug treating patients with traumatic clotted hemothorax. 24 of patients with clotted hemothorax after thoracostomy admitting to Cardiothoracic Surgery Department for 16 month. Administration of streptokinase daily in a dose of 2 cm from 5 to 9 times in the intercostal tube. Results are achieved when drainage is performed within the first 5 days after trauma. With follow up by chest x-ray and CT chest, the decision can be rapidly based on the findings of CT chest after streptokinase injection in chest tube thoracostomy. In conclusion, Intrapleural injection of streptokinase has the ability to breakdown the clots in the pleural space, minimize the thickness and reduce adhesion of pleural layers due to its powerful fibrinolytic and thrombolytic effect. This study has also established that intrapleural streptokinase which consider a new therapeutic choice for curing patients with minimal clotted hemothorax.

KEY WORDS: Clotted hemothorax, Streptokinase, Fibrinolytic drug, CT chest.

1. INTRODUCTION

Hemothorax is one of the most common types of traumas within thorax characterized by bleeding into pleural cavity and often associated with chest wall injury. A minimal hemothorax means a loss of blood with hemodynamic adjustment (Mahoozi, 2016). The cause of traumatic hemothorax is a result of intrapleural or extrapleural injuries (May and Ades, 2013). The respiratory response of traumatic hemothorax may complicated with empyema and fibrothorax depending on the severity of pleural injury and high amount of blood loss (Ball, 2005). In the past, traumatic hemothorax is managed by closed tube drainage through thoracostomy. But, this surgical method is ineffective if the blood began clotted. Insufficient care of post-traumatic clotted hemothorax and repeated thoracentesis are a major risk for secondary bacterial infection leading to sepsis and persistent Broncho pleural fistula (I'nci, 1998; Tomaselli, 2003). The complications of non-treated hemothorax is associated with fibrin threads formation on the surface of pleura with an obvious proliferation fibroblastic and angioblastic cells (Hood, 1989). In this case, the hemothorax transformed to fibrothorax due to inflammatory exudates covering of visceral and parietal pleura and reduces the ability of lung ventilation (Sinha and Sarkar, 1998). So, Early detection and management of hemothorax is of greatest importance in prognosis and complete treatment of the patient (Mahoozi, 2016). Most authors recommended a video assisted thoracoscopic surgery (VATS) in the management of hemothorax as VATS has the ability to give full vision of the pleural cavity with the possibility to adjust chest tube, eliminate of retained clot and avoidance of bacterial infections within the intrathoracic clot and minimal clotted hemothorax (Landreneau, 1995; Cobanoglu, 2011). In a progressive case of fibro thorax, an organized coagulum within the pleural cavity may require decortications through thoracotomy or VATS to mobilize and provide lung re expansion (Meyer, 1997; Lang-Lazdunski, 1997). Thoracotomy and VATS are invasive procedures may Many studies showed clinical outcomes in patients with retained clots who received VATS were more favorable prognosis compared to patients who did not receive early VATS. Even though VATS is supposed to be the top available modality for the management of clotted hemothorax, it is not available in many medical centres. One of the most alternative method to VATS is the use of fibrinolytic therapy within the pleura (Sinha and Sarkar, 1998; Chou, 2015). Streptokinase (SK) is in the anti-thrombotic drug that acts on the fibrinolytic system. Streptokinase was obtained naturally from *Beta hemolytic streptococci*. It is used to break down clots in some cases of myocardial infarction (heart attack), pulmonary embolism, and arterial thrombo-embolism by injection into a vein (Sikri and Bardia, 2007). It is the most effective drug needed in a health system (WHO, 2015). Therefore we assessed the efficacy of streptokinase (SK) administration intrapleurally to enhance the dissolve of minimal hemothorax in the patients' pleural spaces for accelerate the resolution response of clot.

2. METHODOLOGY

Prospective Cohort Study was conducted in Cardiothoracic Surgery Dep., Hospitals of Zagazig University from October 2015 and February 2018 for patients with clotted hemothorax after tube thoracostomy of all ages, both gender (males and females). The study divided into 3 groups: conservative, streptokinase and surgical group. Streptokinase (SK) (250,000 IU) diluted in 100 mL of saline solution was given in a dose of 2 cm from 5 to 9 times daily in intercostal tube. After that, the tube was clamped for 4-6 hours then remove the clamp allowing the destroyed clots to be drained in the underwater seal. The amount of drain was calculated follow up by chest x-ray and repeated this maneuver for 3-5 days with recording this data in patient chart with chest x-ray finding and CT chest.

Multiloculations of pleural fluid were considered as a septations seen on chest CT scan or air-fluid levels in the effusion on the chest radiograph. Loculation of hemothorax was detected when there is no pleural fluid from a chest tube and through chest CT radiography.

Statistical analysis: The obtained results were statistically analyzed using one way analysis of variance (ANOVA) between the groups and followed by multiple comparison test. The p values of <0.05 were considered to be significant. The results are expressed as mean \pm standard deviation (S.D.) for patients in each group.

3. RESULTS AND DISCUSSION

This study was conducted with 24 clotted hemothorax patients after chest tube thoracostomy (table.1&2). Complete response, which represented by relief of symptoms, full drainage of pleural fluid and no enduring space radiographically, occurred in 17 patients (70.8%). Partial response, which represented by relief of symptoms with a minute pleural cavity, occurred in 7 patients in percentage (29.1%). Five patients of partial response (20.8%) may consider a slight responders as they needed decortication. The remain 2 cases of partial response were considered only conservative and follow up in outpatient clinic (OPC).The mean period of time between the diagnosis and thrombolytic treatment was 11.65 \pm 6.38 (range,3 to 8) days. There were no complications related to intrapleural streptokinase treatment. There was no mortality during the course of intrapleural SK treatment.

Hemothorax frequently occurs after a blunt chest trauma leading to a collective clot of the intrapleural blood followed by a thin layer of fibrin and cellular elements coated the pleural surface. This covering develops into a progressively thicker membrane on the visceral and parietal surfaces and forms a sac like structure containing the hemothorax (Hood, 1989). There is a universal agreement that the early treatment of patients with traumatic hemothorax includes chest tube drainage. However, patients with minimal hemothorax may not involve chest tube drainage during treatment and just required follow up (Battistella and Benfield, 2000).Treatment of hemothorax either minimal and/or clotted remains controversial. Computed tomography (CT) scan has been used for evaluation of traumas in the thorax for three decades. More detailed findings were attained with CT scan than with X-ray or physical examination due to difficulty of minimal hemothorax detection by those methods. Therefore, diagnosis of minimal hemothorax is easily made by CT scan. The number of cases in our study were diagnosed as minimal hemothorax after chest trauma and thereby assured with the routine usage of CT scan.

The presented study showed a significant difference in the total amount of drainage, and Period to develop clotted hemothorax in the chest pre and post streptokinase injection for treating of minimal clotted hemothorax (table 3 and figure.1).The clotted hemothorax should be eliminated within a week after injury to avoid the complication of fibrinorhax and empyema. Therefore, many published studies advice fibrinolytic therapy or VATS can be perform in assessment and treatment of clotted hemothorax with good prognosis (Inci, 1998; Tomaselli, 2003).

Along the course of treatment at 4th week, the clot begins to lyses as a result of body response by secreting a large quantity of hypertonic fluid in the pleura. This process can be assisted by intra thoracic fibrinolytic action of streptokinase drug in treating of minimal hemothorax without insertion of inter-costal tube. The presented study showed a significant decrease in clotted hemothorax among all groups after the period of treatment with streptokinase injection. A previous study reported that intrapleural SK has been used in multiloculated empyema in the rabbit's pleural space and not cause any allergic reaction (Strange, 1993). The obtained results also agree with authors who stated that, Streptokinase degrades a variety of proteins, including fibrinous exudates. Therefore, intrapleural SK is applied in the treatment of hemothorax and empyema (Jerjes-Sanchez, 1996; Battistella and Benfield, 2000).

Table.1. Comparison regard clinical and drain among three groups

		N	Mean	SD	Min.	Max.	F	P value
CT chest before Strept injection	Conservative treatment	2	1.3143	0.12150	1.20	1.50	4.270	0.019*
	Success of Streptokinase	17	1.1692	0.18879	0.90	1.40		
	Surgical intervention	5	1.1306	0.14307	0.80	1.40		
Allergy and Side effects	Conservative treatment	2	81.2857	3.68394	75.00	85.00	2.050	0.139
	Success ofStreptokinas	17	85.8462	4.70543	81.00	99.00		
	Surgical intervention	5	83.6944	5.14820	74.00	95.00		
Duration of ICU insertion hours	Conservative treatment	2	44.7143	3.63842	39.00	48.00	1.672	0.198
	Success ofStreptokinase	17	42.9231	4.23205	38.00	49.00		
	Surgical intervention	5	41.6667	4.34248	34.00	49.00		
Total amount of drains CC	Conservative treatment	2	628.5714	97.88234	500.00	800.00	1.274	0.288
	Success of Streptokinase	17	716.1538	126.06470	450.00	850.00		
	Surgical intervention	5	703.8889	127.39764	350.00	900.00		
ICU stay duration hours	Conservative treatment	2	54.1429	9.71989	48.00	75.00	0.115	0.892
	Success of Streptokinase	17	55.6923	7.84628	48.00	72.00		
	Surgical intervention	5	55.6667	7.56684	48.00	72.00		
	Conservative treatment	2	2.6000	1.29099	1.50	5.00	1.414	0.252

Follow up CT chest	Success of Streptokinase	17	3.7692	1.44244	1.20	5.50		
	Surgical intervention	5	3.4000	1.53201	1.30	6.00		
Changes regard CT chest between pre and post groups	Conservative treatment	2	132.1429	52.67646	80.00	220.00	1.634	0.205
	Success of Streptokinase	17	169.9231	72.78560	65.00	265.00		
	Surgical intervention	5	139.9722	48.82124	75.00	265.00		

**NO significant side effects or allergy regard streptokinase injection

Table.2. Post maneuver data of studied patients.

	CT chest finding	Amount of drain in chest tube	Duration of ICT insertion hours
N	24	24	24
Mean± SD	146.44±8.3	83.89±4.2	41.33±4.29
Median	147.0000	84.0000	43.0000
Range	130.0-160.0	74.0-99.0	34.0-49.0

Table.3. Total amount of drains CC, hospital stay duration hours and Period to develop clotted hemothorax

	Total amount of drains CC	Hospital stay duration hours	Period to develop clotted hemothorax after trauma or open heart surgery
N	24	24	24
Mean± SD	697.32±124.7	55.48±7.77	10.21±4.03
Median	700	55	9.5
Range	350-900	48-75	4-20

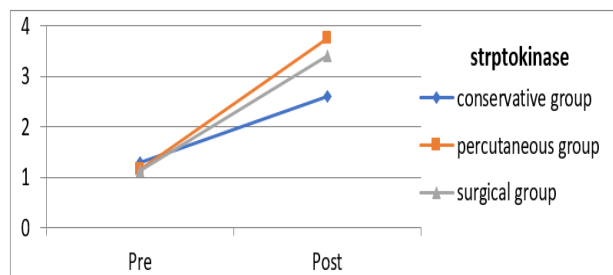


Figure.1. Change regard CT chest in pre and post streptokinase injection between groups

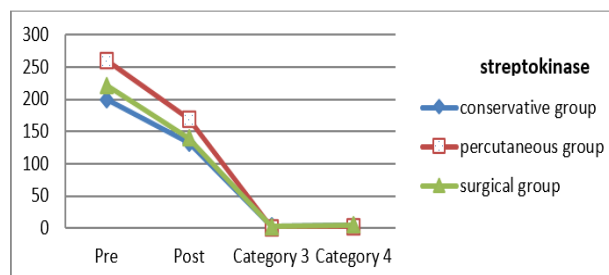


Figure.2. Change regard CT chest after streptokinase therapy among different studied groups

4. CONCLUSION

In conclusion, intrapleural administration of streptokinase has the ability for liquefy clots of traumatic hemothorax due to its fibrinolytic action and subsequently prevented of fibrinous adhesion of the pleural layers. So, streptokinase considered an excellent drug of choice for patients with minimal clotted hemothorax.

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