Zagazig University Medical Journal
www.zumj.journals.ekb.eg
https://dx.doi.org/10.21608/zumj.2022.128724.2530 Volume 29, Issue 2, March 2023, Page (601-611)
Manuscript ID ZUMJ-2203-2530 (R1)
DOI **10.21608/zumj.2022.128724.2530**

ORIGINAL ARTICLE

Surgical Outcome Post Early Thoracoscopic Surgery for Clotted Traumatic Hemothorax Versus Thoracotomy.

Ayman M. Shaalan[1,2], Ahmed M. Abdelazim[1], Eman E. El Wakeel[3], Yusra Ahmed Elkamail[4]

1 Cardiothoracic surgery department, Faculty of Medicine, Benha University, Egypt.
2 Dallah Hospital, cardiac center, Riyadh, Saudi Arabia,
3 Anatomy and embryology department, Faculty of Medicine, Benha University, Egypt.
4 Faculty of Mathematic science and informatics, university of Khartoum

Corresponding author
Ayman M Shaalan
Cardiothoracic surgery department, Faculty of Medicine, Benha University, Egypt
E-mail:
shalaanayman@yahoo.com

Submit Date 2022-04-14
Revise Date 2022-05-24
Accept Date 2022-05-31

ABSTRACT

Background: Chest trauma complicated with hemothorax is increasing nowadays either secondary to road traffic accidents (RTA) or chest trauma especially if associated with fractures ribs or sternum. Hemothorax is the presence of blood in the pleural space. clotted hemothorax is a serious problem associated with the presence of fluid loculation by fibrous adhesions, trapped lungs and increased the risk of developing empyema. Insertion of chest drain is the classic primary management modality in most of the cases. Nowadays video-assisted thoracoscopic surgery (VATS) is the cornerstone in management of clotted hemothorax. Our objective is to assess the surgical outcome of early intervention using VATS compared to conventional thoracotomy in treatment of post traumatic retained hemothorax.

Methods: our study is a retrospective single blinded study included 120 patients with post traumatic clotted hemothorax randomly divided into 2 groups: Group I: include 60 patients who were operated through thoracotomy and group II: include 60 patients who were operated through VATS.

Results: The study showed that group I had longer postoperative period to return to normal activity (2-3) weeks while group II was (1-2) weeks, with significant difference between both groups (P = 0.01).

Conclusions: VATS is the treatment of choice for traumatic hemothorax rather than conventional thoracotomy as it is less invasive, smaller surgical wound and allow early evacuation of retained hemothorax, minimizing or preventing complications with better patient satisfaction.

Key Words: Clotted hemothorax, VATS, thoracotomy.

INTRODUCTION

Hemothorax is caused by the presence of blood in the pleural cavity. Post traumatic clotted hemothorax is a serious problem associated with the presence of fluid loculation by fibrous adhesions, trapped lungs and increased risk of developing empyema. Insertion of a chest drain is the classic primary management modality in most cases. Nowadays video-assisted thoracoscopic surgery (VATS) is the cornerstone in the management of clotted hemothorax.

Generally, hemothorax may be traumatic, iatrogenic, or spontaneous hemothorax (Cancer related). Iatrogenic hemothorax may be caused as a complication of cardiopulmonary surgeries, indwelling catheter insertion or lung biopsies [1]. Spontaneous hemothorax is precipitated by tumors such as schwannomas and hepatocellular carcinoma, pleural metastasis or anticoagulant therapy complications [2].

The most common etiology of death throughout the world is Trauma. Morbidity and mortality due to chest trauma is the second cause after head injury, affecting approximately two-thirds of patients [3]. The most frequent complication after thoracic trauma is hemothorax. A random estimation of hemothorax related to chest trauma in USA reaches up to 300,000 cases over the year [4]. Anatomical bony cage of the chest with ribs and sternum protects vital internal organs, while the presence of hemothorax is usually associated with fracture ribs and in severe cases associated sternal fracture. Two

thirds of non-penetrating chest trauma accounted to have rib fractures as a common finding [5].

According to a statistical report in the USA the number of cases with fracture ribs is more than 350,000 in 2017. The posterior angle of the rib is the commonest site of fracture as it is the weakest point to receive the impact of trauma, also the ribs in the mid zone ranging from the fourth to the ninth ribs are more commonly fractured. In children the ribs are more elastic movable with more cartilaginous areas and because of that it is less common to find fracture in children unless in severe forced compression [6]. One of the studies revealed that the most common cases admitted in thoracic surgery departments suffered from fracture ribs which estimated to reach over 1 million cases in China. This figure is more than the annual cases of esophageal and bronchogenic carcinoma [7].

Moreover, thoracic trauma is responsible for more than 20–25% of all traumatic deaths in Egypt, Saudi Arabia and worldwide [8].

The management of hemothorax depends on the patient's vital signs. The intercostal tube (ICT) and surgical intervention are done to control bleeding in patients especially those who are shocked or if there is flail chest in need for fixation or chest wall reconstruction. However, failure of primary management with ICT to drain hemothorax and the retained clotted hemothorax occurs in 5% to 30% of cases [9].

After stabilization of traumatic cases, the next step is to manage post-traumatic complications which are mainly retained clotted hemothorax and empyema formation [10].

The retained hemothorax should be evacuated within 7 to 10 days of trauma otherwise surgical intervention will be required either by thoracotomy or video assisted thoracoscopic surgery (VATS) [11]. VATS is implemented for the treatment of many cases of pleural collection rather than conventional thoracotomy [12].

The aim of our study is to assess the early VATS intervention for patients with retained hemothorax in comparison to convention thoracotomy.

METHODS

This study is a retrospective randomized study, included (120) patients with hemothorax post trauma which was not completely drained with conventional chest tube between April 2018 to March 2021, in two tertiary centers; Benha university hospital, Egypt and Dallah hospital, Saudi Arabia. Written informed consent was obtained from all participants, the study was approved by the research ethical committee of faculty of Medicine, Zagazig university. The study was done according to the code of ethics of the world medical association for study involving humans.

Patients were divided into 2 groups: Group I: included 60 cases post thoracotomy for clotted hemothorax. Group II: included 60 cases who underwent VATS for evacuation of clotted hemothorax. The study included all adult cases above 16 years, who were diagnosed to have clotted hemothorax post chest trauma by computed tomography (CT) chest as a residual after insertion of a chest drain as primary management protocol. All cases underwent thoracic intervention either with VATS or thoracotomy as elective cases not associated with other problems requiring emergency surgery or other surgical procedures. We excluded young patients (pediatric age group), cases post cardiac surgery or other surgical interventions and cases who received thrombolytic therapy intra-pleural for residual collection. All patients did blood investigations, chest x ray and CT chest for diagnosis of clotted hemothorax **(Fig.1).** All patients' data documented were collected and analyzed, as well as the peri-operative data.

Surgical Technique:

Group I: who underwent conventional exploratory thoracotomy.

Under general anesthesia with full monitoring of patient hemodynamics, one lung ventilation was used in small number of cases. Lateral thoracotomy incision through fifth intercostal space was opened as small as possible -mini thoracotomy- (muscle-sparing thoracotomy) according to anatomical localization of the collection after positioning the patient in lateral decubitus position. Removal of the retained blood clots and decortication were done either intrapleural or extra pleural as the dense of adhesion and thickness of pleura.

Group II: (VATS procedure)

General anesthesia was done with double-lumen tube for more exploratory field. Patients positioned in lateral decubitus with slight tilt or adjustment of the bed according to the area needed to be exposed under aseptic technique. either uni-portal VATS or Standard thoracoscopy were used according to the radiological guidance. 5mm port was used to insufflate CO2 at 12-15mmHg to deflate the lung taking care of adhesions which may need careful dissection using blunt dissection or diathermy (**Fig.2).** The equipment used included a telescope 30° angle and a xenon light source through 5mm port. Other one or two 5mm or 10-mm ports made according to the area needed to expose commonly at the fourth intercostal space according to the localization of collections.

In both groups blood clots were removed by using a standard suction instrument or a suction–irrigator

system. Fibrin or blood adhesions were carefully decorticated then Floating test was done to evaluate the presence of air leaks. One or two large-bore chest tubes were placed before chest closure (**Fig.3).**

Statistical analysis:

All data were collected, statistical analysis was done using SPSS version 22.0. Data were non-normally distributed, median value of numerical variables was used as a measure of central tendency for description and interquartile range (IQR) used as a measure of discerption (variations). Frequency and percentage were used to describe the categorical variables. Mann Whitney u test is a non-parametric test used to compare median of values across different groups (p-value is significant if <0.05). Generalized linear Model-GLM (Poisson regression analysis) was conducted to calculate odds ratio among subgroups.

RESULTS

The current study included 120 patients who were collected according to the inclusion criteria from two tertiary centers after consent had been taken from all the patients for publication and ethical committee approval. All cases underwent thoracic exploration either through thoracotomy or thoracoscopic after development of hemothorax and its sequalae. They were classified into 2 main groups. First group (N=60): who were explored through thoracotomy and intervention and second group (n=60) who underwent thoracoscopic intervention. Each group were subdivided into two subgroups, subgroup (a): intervention was done in duration ≤5 days. Subgroup (b): intervention was done after 5 days. All patients data were collected and analyzed. Group Ia (intervention thoracotomy within 5 days): n= 36. Subgroup Ib (thoracotomy was done after 5 days): n= 24. Subgroup Ila (thoracoscopic intervention were done within 5days: n= 31, while subgroup IIb (intervention were performed after 5 days: n= 29.

Table 1 shows the demographic data in between the 4 sub-groups. There is no significant difference regarding age, BMI, and gender as well as regarding the associated comorbidities.

The median expression of age was 50 (IQR:52-49.5) and 42.5 (IQR: 55-33.5) for thoracotomy and thoracoscopic groups respectively. The median expression of BMI was 28 (IQR:30-27) and 29(IQR: 31-27) for thoracotomy and thoracoscopic groups respectively. No significant difference between both groups according to comorbidities e.g., diabetes, smoking, the use of antiplatelet and anticoagulants and the presence of renal impairment.

Chi square test showed significant difference between both main groups according to the nature of lesions as in multiple rib fractures and bilateral sides fracture with p-value 0.0005, 0.008 respectively. The thoracoscopic subgroups were more serious. There was no difference in the remaining features between thoracotomy and thoracoscopic groups with p-value >0.05. RTA is the main cause of chest trauma in all, secondly falling down then stab wound to the chest.

Table 2 compares the operative and post operative data in the main groups. The median operative time was 103.5 (IQR=110.25-97.75), 55(IQR=81.25-25) of thoracotomy and thoracoscopic groups respectively. The median days of stay at hospital was 8(IQR=9-6.75), 4.88(IQR=7-3.5) of thoracotomy and thoracoscopic groups respectively. Mann Whitney U test showed that there were significant differences in distributions of operative time and hospital stay, p-values were <0.001 and <0.001 respectively, between thoracotomy and thoracoscopic groups. Chi-Square test revealed that there were statistically significant differences in cases who had left side exploration, one tube, two tubes, one lung ventilation, need for thoracic epidural post operative and pain, p-values 0.008, <0.001, <0.001 <0.001, <0.001 and 0.02 respectively, between thoracotomy and thoracoscopic groups.

Figure 4 and Table 2 show that the distribution of hospital stay, operative time are significantly different between the general groups; Thoracotomy and thoracoscopic. The range of hospital stay of patients belonging to thoracotomy group is between 6.75 to 9 days, while it is between 3.5 to 7 days for patients belonging to thoracoscopic group. Operative time for thoracotomy ranged between 97.75 to 110 minutes, while for thoracoscopic group ranged between 25 to 81.25 minutes **(Table 2)**.

Chest tube drainage post operatively showed high significant difference in group I ranged between 200-650 ml; its mean was (300±65ml). On the other hand the drainage in group II it ranged between 90-300 ml, its mean was (150±25ml) P = 0.001 **(Table 2).** In group I, the postoperative period recovery to return to normal activity ranged between 2-3 weeks with a mean period of 2.2±0.71 weeks while in group II it ranged between 1-2 weeks with a mean period of 1.03±0.81 weeks (P = 0.01) **(Table 2)**.

In table 3, Mann Whitney U test proved that there were statistically significant differences in hospital stay, operative time and the duration of primary chest tube inserted till the definitive management within sub-groups in both thoracotomy and thoracoscopic groups; p-values were <0.001 and

<0.001 respectively. The majority of cases were explored on the left side with significant difference in the thoracotomy group p-value=0.006, while insignificant in group II. Also it was noted that the right-side exploration between the all subgroups were insignificant. In the post operative, Chi-square test revealed that there was statistically significant difference in proportion of the use of one-tube, two tubes at the end of procedure as the majority of thoracoscopic group used one tube in comparison to the thoracotomy group, p-values <0.001, <0.001 respectively within sub-groups. Regarding pain post operatively in both groups there was significant difference P-value < 0.001. Cases who required re exploration were either due to re-accumulation of clotted blood or pus as well as the persistent air leak post operative, these were significant in thoracotomy group were intervention was delayed. Also, in thoracoscopic group that was insignificant **(Table 3).**

Regarding operative time, Kurskulwallis test is non-parametric test equivelent to One-Way Anova (parametric) used to test the significant difference in operative time among subgroups .The result showed that group IIa had less operative time compared with other sub-groups with p-value<0.001 **(Table 4 & Fig. 5)**

Hospital stay variable is a count number of days which follows Poisson distribution. Generalized Linear Model-GLM (Poisson Regression analysis) was conducted to calculate odds ratio among sub-groups. Group IIa is less likely in hospital stay duration by 0.518 times compared with group Ia and group IIb **(Table 5).** Group IIa had a Less hospital stay compared with all other sub-groups (OR= 0.518, with 95% CI (0.412,0.652), p-value=0.000). Group Ib had highest hospital stay compared with all other sub-groups (OR=1.380, with 95% CI (1.144,1.665), p-value=0.001). Group Ia had no significant difference compared with group II b (OR= 0.979, with 95% CI (0.814,1.179), p-value=0.825) and has less hospital stay compared with group Ib **(Fig. 6).**

Regarding satisfaction level there was significant difference between the two main groups p-value <0.001 as the thoracoscopic group showed the best satisfaction. **Fig. 7** shows that thoracoscopic goup (a) had best satisfaction level, 25(81%) of them were excellent in their satisfaction among all other sub-groups. Thoracotomy group (b) had a worst satisfaction, 6 (25%) of them were poor. Regarding patient satisfaction there were significant difference in between all subgroups **(Table 6)**. Kurskul -wallis test is non-parametric test used to test the significant difference in satisfaction level among subgroups. It revealed that group IIa had the best satisfaction level with p-value <0.001 **(Table 7)**.

Table1: Patient characteristics, associated comorbidities and nature of lesions.

Patient data	**Group I (Thoracotomy group) n=60 Median**		**Group II(Thoracoscopic group) n=60 Median**		**p-value Between Group1(Thoracotomy)and GroupbII(Thoracoscopic**	**Conclusions**
Subgroups	Gia(n=36) ≤5 days	Gb(n=24) >5days	GII a (n=31) ≤5days	GII b(n=29) >5days		
Age	Median= 50(all group1)		Median= 42.5 (all group 2)			
BMI	27.75	30	29	28	0.510	NS
Chi Square test – Difference in proportion of categorical variables between Group I and Group II						
Gender						
Male	23(63.9%)	17(70.8%)	20(64.5%)	19(65.5%)	0.84	NS – Non-Significant
Female	13(36.1%)	7(29.2%)	11(35.5%)	10(34.5)		
Comorbidities						
Diabetic	14(38.9%)	10(41.7%)	8(25.8%)	11(37.9%)	0.341	NS
Smoker	9(25%)	17(73.9%)	18(58.1%)	17(58.6%)	0.180	NS
On anticoagulation	3(8.3%)	5(20.8%)	0	3(10.3%)	0.114	NS
On antiplatelet	8(22.2%)	15(62.5%)	9(29.03%)	20(68.9%)	0.269	NS
Renal impairment	1(2.8%)	2(8.3%)	0	1(3.4%)	0.309	NS
Nature of lesions						
Multiple rib fracture	23(63.9%)	20(83.3%)	31(100%)	29(100%)	0.0005	HS*
Unilateral side	21(58.3%)	19(79.2%)	27(87.1%)	20(68.9%)	0.152	NS

Patient data	Group I (Thoracotomy group) n=60 Median		Group II(Thoracoscopic group) n=60 Median		p-value Between Group1(Thoracotomy)and GroupbII(Thoracoscopic	Conclusions
Bilateral sides	2(5.6%)	1(4.2%)	4(12.9%)	9(31.03%)	0.008	HS*
Sternal fracture	4(11.8%)	5(20.8%)	7(23.3%)	6(20.7%)	0.367	NS
Lung contusion	17(47.2%)	18(75%)	27(87.1)	4(13.8%)	0.463	NS
Etiology						
Fall	15(41.7%)	7(29.2%)	7(22.6%)	6(20.7%)	0.071	NS
RTA	17(47.2%)	11(45.8%)	15(48.3%)	17(58.6%)	0.465	NS
Stab chest	3(8.3%)	4(17.4%)	7(22.6%)	3(10.3%)	0.454	NS
Blunt trauma	1(2.8%)	2(8.3%)	2(6.5%)	3(10.3%)	0.717	NS-Fisher exact test because expected value less than 5

Table2: Overall Comparison between main groups (Thoracotomy and Thoracoscopic).

Patient data	Group I (Thoracotomy group) n=60	Group II (Thoracoscopic group) n=60	Mann-Whiteny U test-p-value Between Thoracotomy & Thoracoscopic	Conclusions
	Median – IQR(Range)	Median-IQR(Range)		
Duration of chest tube/day	5 and IQR (12-5)	4.8 and IQR (7.63-1.5)	0.005*	HS
Operative time/minutes	103.5 and IQR (110.25-97.75)	55 and IQR (81.25-25)	<0.001*	HS
Hospital stay/day	8 and IQR(9-6.75)	4.88 and IQR(7-3.5)	<0.001*	HS
	Chi-Square test – Test the difference of Proportions between main groups			
Site of exploration				
Right side	24(40%)	19(31.7%)	0.341	NS
Left side	26(44.1%)	41(68.3%)	0.008*	HS
Number of drains post operative				
One tube	8(13.3%)	50(83.3%)	<0.001*	HS
Two tubes	52(86.7%)	10(16.7%)	<0.001*	HS
Amount drained post operative/ml	300±65	150±25	0.001	HS
Post operative course				
One lung ventilation	25(42.4%)	60(100%)	<0.001*	HS
Need for thoracic epidural post operative	20(30%)	4(6.7%)	<0.001*	HS
Need for re intubation	0(100%)	0(100%)	Constant value for all cases	
Blood transfusion	6(10%)	4(6%)	0.509	NS
Re exploration	5(8.3%)	2(3.3%)	0.439	NS
Re accumulation	6(10%)	1(1.7%)	0.114	NS
Wound infection	2(3%)	2(3%)	1	NS
Air leak	1(1.7%)	1(1.7%)	1	NS
Return to normal activity in weeks	2.2±0.71	1.03±0.81	0.01*	
Pain post operative				
Low pain≤3/10	29(48.3%)	47(78.3%)	0.02*	S- Significant Difference
Moderate to severe>3 /10	31(51.7%)	13(21.7)		

Table 3: Comparison within Sub-groups (GIa & b) & (GIIa & b).

Patient data	Group I (Thoracotomy group) n=60		P-value	Group II (Thoracoscopic group) n=60		P-value
	GI a(n=36)	Gib(n=24)	P-value of Mann-Whitney U test Between G1 a & b	GII a(n=31)	G IIb(n=29)	P-value of Mann Whitney U test Between GII a & b
Duration of primary chest tube/day	5	12	<0.001* High statistically Significant difference within sub-group I	3.25	8	<0.001* High statistically significant difference within sub-groupII
Operative time/minutes	99	114.5		40	85	
Hospital stay/day	7	10		3.25	7	
Site of exploration						
Right side	15(41.7%)	9(37.5%)	0.747 NS	8(25.8%)	11(37.9%)	0.313 NS
Left side	21(58.3%)	5(20.8%)	0.006*	23(74.2%)	18(62.1%)	0.313
One tube	8(22.2%)	0	0.017*	31(100%)	19(65.5%)	<0.001*
Two tubes	28(77.8%)	24(100%)	0.017*	0	10(34.5%)	<0.001*
Post operative						
One lung ventilation	15(4.7%)	10(41.7%)	0.89	31(100%)	29(100%)	Constant values
Need for thoracic epidural post operative	9(25%)	11(45.8%)	0.30	0	4(13.8%)	0.049
Need for re intubation	0	0	Constant values	0	0	Constant values
Blood transfusion	5(13.9%)	12(50%)	0.387	1(3.2%)	3(10.3%)	0.346
Re exploration	0	5(20.8%)	0.008*	0	2(6.9%)	0.229
Re accumulation	4(11.1%)	2(8.3%)	0.725	0	1(3.4%)	0.297
Wound infection	5(13.9%)	9(37.5%)	0.240	0	2(6.9%)	0.229
Air leak	1(2.8%)	6(25%)	0.410	0	1(3.4%)	0.483
Pain post operative						
Low pain≤3/10	16(44.4%)	9(37.5%)	<0.001*	26(83.9%)	21(72.4%)	<0.001*
Moderate to severe>3 /10	20(55.6%)	15(62.5%)		5(16.1%)	8(2.6%)	

Table 4: The result of Kurskul -wallis for Operative time among sub-groups.

Sub-groups_Comparisons	P-value	Comments	Median	
GI a and G II a	<0.001	Significant difference in- **Operative time** between G I a and G II a G II a had less operative time than G I a	99 For G I a	40 For G II a
G I b < G II b	<0.001	Significant difference in- **Operative time** between G I b and G II b G II b had less operative time than G I b	G I b 115	G II b 85

Table 5: Result of GLM analysis using Poisson Regression Model.

Sub-groups	Odds ratio (OR)	95% CI	P-value
GI a	0.979	(0.814,1.179)	0.825 Nonsignificant
G I b	1.380	(1.144,1.665)	0.001* Significant
G II a	0.518	(0.412,0.652)	0.000* Significant
G II b	1	Reference category used in analysis	

Patient data	Group I (Thoracotomy) n=60		Chi-Square test between Sub-group1	Group II (Thoracoscopic) n=60		Chi-Square test between Sub-group2	p-value Between Thoracotomies And Thoracoscopic (Main groups)	Conclusions
Satisfaction	GI a(n=36)	Gib(n=24)	P-value	GII a(n=31)	G IIb(n=29)	P-value	Chi-Square test	
Poor	4(11.1%)	6(25%)	0.313 Non-significant Difference in level of satisfaction Within sub-group1	1(3.2%)	3(10.4%)	<0.001* High significant difference in satisfaction Levels within Sub-group2	<0.001*	HS-High significant difference in levels of satisfaction between main groups
Good	27(75%)	14(58.3%)		5(16.2%)	19(65.5%)			
Excellent	5(13.9%)	4(16.7%)		25(80.6%)	7(24.1%)			

Table 6: Comparison of Satisfaction levels between main groups and sub-groups.

Tabe 7: The result of Kurskul -wallis for satisfaction level among sub-groups.

Sub-groups_Comparisons	P-value	Comments	Median	
GI a and G II a	<0.001	Significant difference in satisfaction levels G I a was Good while G II a was Excellent	Good For G I a	Excellent For G II a
G I b < G II b	0.574	Non-significant difference in satisfaction levels Both G I b and G II b were Good	Good For G I b and G II b	

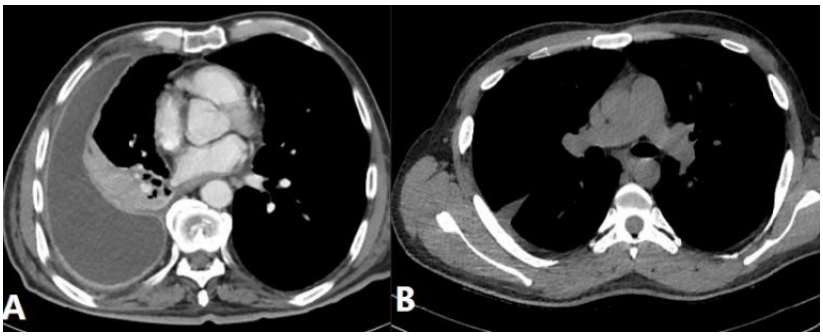

Figure 1: CT diagnosis for (A) organized collection with thickened pleura, (B) post VATs decortication.

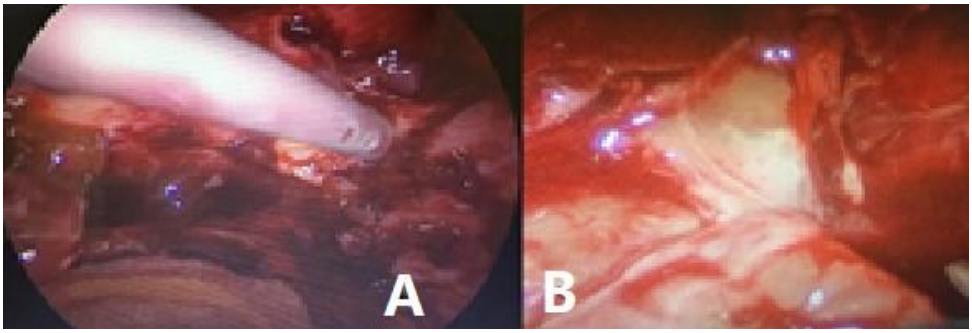

Figure 2: VATs exploration (A) suction of early clotted blood, (B) complicated with empyema and adhesions.

Figure 3: Thoracic exploration (A)mini-thoracotomy, (B)Antero-lateral thoracotomy and (C) VATs.

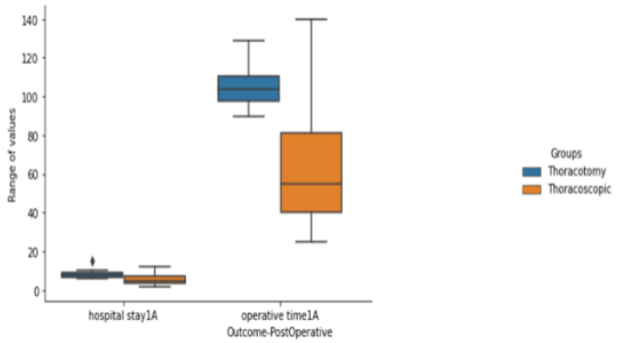

Figure 4: Boxplot-Distribution of outcome between two groups

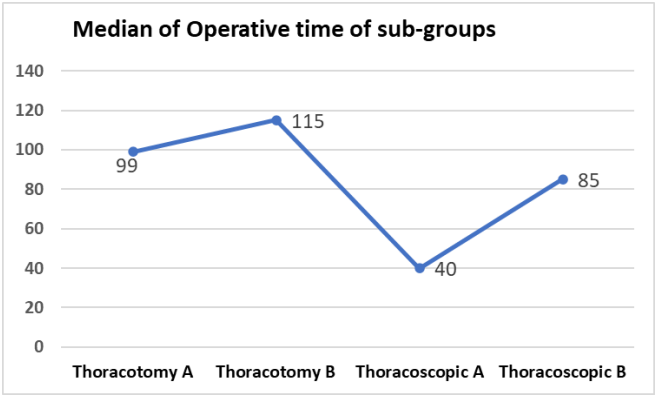

Figure 5: Median operative time of the subgroups.

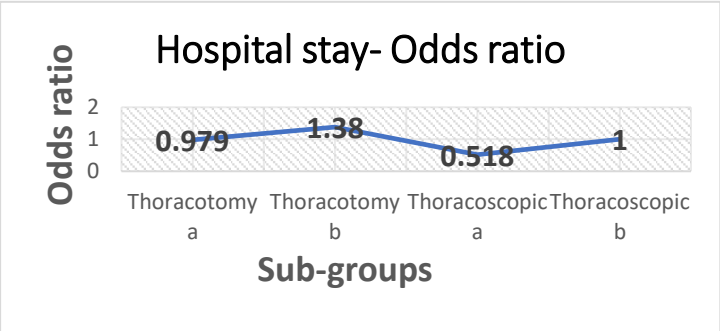

Figure 6: Hospital Stay-Odds ratio.

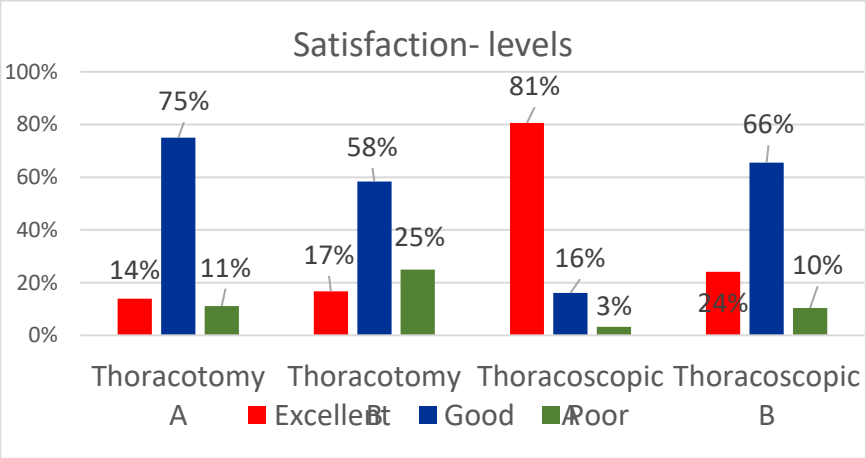

Figure 7: Distribution of Satisfaction levels within each sub-groups

DISCUSSION

Thoracic trauma is a dangerous problem in our society owing to the large number of blunt and penetrating trauma which is managed by tube thoracostomy including pneumothorax, hemothorax, and hemopneumothorax and this treatment together with oxygen and pain killer therapy suffices in most cases. However, some patients require surgical intervention either by elective thoracotomy or VATS owing to increase in complications, such as retained hemothorax and empyema [13]. In our study we selected the patients with retained clotted blood post traumatic hemothorax.

Surgical intervention after 10 days for retained hemothorax had a higher rate of complications post thoracotomy and empyema. Our study showed that, those who underwent VATS within 5 days was associated with a lower chance to be converted to thoracotomy, decreased rates of persistent empyema (0%) decreased hospital stay and better patient satisfaction, while those who underwent VATS >5 days after primary management required additional interventions for empyema and may need to revert to conventional thoracotomy [14].

One study found that complications in open thoracotomy were more common, also the change from VATs to thoracotomy was 6.25% most commonly due to excessive adhesion [15].

Yim APC and his colleagues had found that the operative time during VATS was much decreased. Our study showed significant difference between VATs and thoracotomy groups, especially if early intervention had done [16].

Most of the collections complicated secondary to RTA and associated with fracture ribs in some cases, were associated with sternal fractures. Kaya and his colleagues had found that blunt injury was the commonest cause of retained blood [17].

Many studies proved that the mid ribs zone was the most likely to fracture. The presence of flail segment or stove in chest occurred mainly in this zone with high mortality rate because of the long ribs with angulation and this area is more exposed to trauma [18]. Early thoracoscopic intervention had better surgical outcome if was done within 5 days, compared to delayed thoracoscopic surgery. Additionally, VATs had better outcome in comparison to conventional thoracotomy. Goodman and his colleagues had concluded that early interference within 3 days after primary management with VATS decreases the complications as well as hospital stay [19].

Our study revealed that Operative time for thoracotomy ranged between 97.75 to 110 minutes, while for thoracoscopic ranged between 25 to 81.25 minutes. As well the results revealed that operative time among subgroups showed G IIa had Less operative time compared with other sub-

groups Lee and his colleagues were doing VATS within 5.8 days after indwelling the ICT as primary management and that was similar to our study. Also, they found that the average operative time in VATS group was 139.7 min which was explained by the presence of associated rib fractures needed fixation, lung injury and surgeon experience. In that study lung lacerations, ribs penetrate to lung tissue, retained blood were the most common findings during operation [20].

Bashir and his colleagues had found that no wound infection as complication in all patients postoperatively during VATS which was similar to our study [21].

Other study showed that the conversion rate to open thoracotomy either mini-incisions or conventional one was about 13.8-31% which is different to our cases [22].

One study revealed that pain following VATS was markedly decreased in its severity in the first three days post operatively, this was similar to our study [23]. One study reported that there was no significant difference in surgical outcome between patients with postoperative pain and pain free patients [24]. Also, Koryllos ans Soelben found in late follow up there was no difference in pain between VATS and thoracotomy groups and this was against our study [25].

Paul S and colleagues had found that the hospital stay in thoracoscopic group was significantly less than in thoracotomy cases, this was similar to our results which showed significant improvement of hospital stay, pain post operative, the use of thoracic epidural and patient satisfaction especially in G IIa [26]. VATs is an ideal method for treating retained hemothorax specially if dine early within 5 days or less once indicated. This improved surgical outcome by reduction in the hospital stay and improve patient satisfaction.

CONCLUSION

VATS is the treatment of choice for traumatic hemothorax rather than conventional thoracotomy as it is less invasive, smaller surgical wound and allow early evacuation of retained hemothorax, minimizing or preventing complications with better patient satisfaction.

ACKNOWLEDGMENT

Surgical team and wound care team for their efforts in following complicated cases**.**

REFERENCES

1. Patrini D ,Panagiotopoulos N, Pararajasingham J, Gvinianidze L, Iqbal Y, Lawrence D. Etiology and management of spontaneous haemothorax, J Thorac Dis. 2015 Mar; 7(3): 520–526.
2. Hiraga M, Omura N, Sato M , Yamamura A, Obera M , Sato J, et al. Hemothorax caused by spontaneous rupture of hepatocellular carcinoma: a case report and review of the literature. World J Surg Oncol. 2012; 10: 215.
3. Ludwig C, Koryllos A. Management of chest trauma. J Thorac Dis, 2017; 9: 172–177
4. Smit HJ, Boersma WG, Stigt JA. Treatment of haemothorax. Respir Med, 2010; 104:1583–1587.
5. Simon BJ, Cushman J, Barraco R, et al. Pain management guidelines for blunt thoracic trauma. J Trauma 2005;59:1256-67. 10.1097/01.ta.0000178063.77946.f5
6. Pieracci FM, Majercik S, Ali-Osman F, et al. Consensus statement: Surgical stabilization of rib fractures rib fracture colloquium clinical practice guidelines. Injury 2017;48:307-21. 10.1016/j.injury.2016.11.026 .
7. Chen W, Zheng R, Baade PD, et al. Cancer statistics in China, 2015. CA Cancer J Clin 2016;66:115-32. 10.3322/caac.21338 .
8. Elghoboshy KI, Huissen WM, Eldomiaty HA, Salama KM, Elshaboury IM. Role of bedside sonography in the assessment of patients with chest trauma in the emergency department of Suez Canal University Hospital, Int Surg J 2017; 4:465.
9. Lin HL, Chou YP, Wu TC. Video-assisted thoracoscopic surgery for retained hemothorax in blunt chest trauma, Curr Opin Pulm Med 2015; 21:393–398.
10. Diaz JJ, Bruns BR. Early and persistent hemothorax and pneumothorax, Curr Trauma Rep, 2015; 1:251–256.
11. Franklin GA, Harbrecht BG, Richardson JD, Smith JW. Early VATS for blunt chest trauma: a management technique underutilized by acute care surgeons, J Trauma Acute Care Surg ,2011; 71:102–107.
12. Sanna S, Bertolaccini L, Brandolini J, Argnani D, Mengozzi M, Pardolesi A, et al. Uniportal video-assisted thoracoscopic surgery in hemothorax. J Vis Surg. 2017; 3: 126.
13. Dogrul BN, Kiliccalan I, Asci ES, Pekerayed SC. Blunt trauma related chest wall and pulmonary injuries: An overview. Chin J Traumatol. 2020 Jun; 23(3): 125–138.
14. Coimbra R. Chest trauma. In: Handbook of Division of Trauma, Surgical Critical Care, Burns and Acute Care Surgery", 3rd edition, 2017; 82-109.
15. El-Khayat H, Emad M, Farhgaly A Ayyad MKAS. Thoracoscopic evacuation compared with reinsertion of thoracostomy tube in persistent traumatic hemothorax. J Curr Med Res Pract 2018; 3: 81-86.
16. Yim APC, Wan S, Lee TW, Arifi AA. VATS Lobectomy Reduces Cytokine Responses Compared with Conventional Surgery. Ann Thorac Surg 2000; 70:243–7.
17. Kaya H, Kafali ME, Kocak S, Aydin K, Sahin M, Duran A, et al. Efficacy of aprotinin treatment on bilateral blunt chest trauma created in rabbits, J Pak Med Assoc 2013; 63: 32-37.
18. Pal K, Satyendra P. A prospective randomized trial on trauma thoracic cage with rib fracture especially first rib fracture and associated complications,

International Surgery Journal. 2016 Aug;3(3):1278-1282.
19. Goodman M, Reed M, Lewis J, Guitron J, Pritts T, Starnes S. Video-assisted thoracoscopic surgery for acute thoracic trauma. J Emerg Trauma Shock, 2013; 6: 106-109.
20. Lee SH, Lee J, Kwon OS, et al. Thoracoscopy in Management of Chest Trauma: Our Three-year Jeju Experience. J Trauma Injury 2017; 30(2): 33-40.
21. Bashir A, Brzeziński Z, Kaperczak J, et al. Video-assisted thoracic surgery in hemothorax evacuation after cardiac surgery or cardiac interventions, Kardiochir Torakochir Polska, 2017; 14 (3): 154-157.
22. Yokobori S, Watanabe A, Matsumoto G, Onda H, Masuno T, Fuse A , et al . Time course of recovery from cerebral vulnerability after severe traumatic brain injury: a microdialysis study. J Trauma. 2011;71(5):1235-1240.
23. Bayman EO, Parekh KR, Keech J, Selte A, Brennan TJ, Gergis SD. A PROSPECTIVE STUDY OF CHRONIC PAIN AFTER THORACIC SURGERY. Anesthesiology. 2017 May; 126(5): 938–951.
24. Wildgaard K, Ringsted TK, Hansen HJ, Petersen RH, Werner MU, Kehlet H. Quantitative sensory testing of persistent pain after video-assisted thoracic surgery lobectomy. Br J Anesthesia 2012; 108(1): 126-33.
25. Koryllos A, Stoelben E. Video assisted thoracic surgery vs. thoracotomy regarding postoperative chronic pain. J Thorac Dis 2017; 9(10): 3498-3500.
26. Paul S, Altorki NK, Sheng S, Lee PC, Harpole DH, Onaitis MW et al. Thoracoscopic lobectomy is associated with lower morbidity than open lobectomy: A propensity-matched analysis from the STS database. J Thorac Cardiovasc Surg,2010;139:366-78

How to cite

Shaalan, A., abdelazim, A., El Wakeel, E., Elkamail, Y. Surgical Outcome Post Early Thoracoscopic Surgery for clotted Traumatic Hemothorax versus thoracotomy. Zagazig University Medical Journal, 2023; (601-611): -. doi: 10.21608/zumj.2022.128724.2530