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Surgery

Comparative study of Video Assisted Thoracoscopic Surgeries and open Thoracotomy in management of pulmonary diseases

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Abstract **Original Research Article**

Traditionally lung resections were done through an open thoracotomy that involved an extensive incision. Now a day Video Assisted Thoracoscopic Surgeries has been preferred alternative for many thoracic surgical procedures. Use of VATS as a definitive therapeutic tool in pulmonary diseases is still under scrutiny. So this study was conducted to evaluate safety and efficacy of video assisted thoracoscopic surgery. So this cross sectional study was done to compare postoperative pulmonary function test, hospital stay and analgesic requirement in VATS operated patients with age, weight and gender matched patients subjected to open Thoracotomy. Out of total 43 study patients, 20 patients treated by VATS were included in Group-A and 23 patients treated by open Thoracotomy were included in Group- B. The vital capacity was significantly higher in VATS operated patients than in open thoracotomy patients. The forced expiratory volume, forced vital capacity and peak expiratory flow in VATS operated patients were significantly higher than open thoracotomy patients. Postoperative pain was significantly less in VATS operated patients than open thoracotomy patients. We conclude that video assisted thoracoscopy has been shown to be superior to open thoracotomy for the treatment of various pulmonary diseases.

Key words: Video Assisted Thoracoscopic surgery, open Thoracotomy, pneumothorax, FEV1, peak expiratory flow.

INTRODUCTION

Video assisted thoracoscopic surgeries (VATS) have evolved just from biopsies into an important option for diagnostic tool in thoracic disease. Traditionally, lung resections were done through an open thoracotomy that involved an extensive incision through the latissimus dorsi muscle with rib spreading In 1993, clinical reports of video-assisted thoracoscopic surgery (VATS) lobectomy for NSCLC were first presented by Dr William Walker and colleagues[1]. Thoracotomy provides excellent exposure of the thoracic organs, but requires dissection of large muscles and the ribs [2]. VATS is a minimally invasive procedure that uses a small-access incision and does not require large muscle dissection. Now a day VATs has been preferred alternative for many thoracic surgical procedures than an open thoracotomy. According to the individual patient some questions need to be answered like what is the best procedure for the patient and what is the appropriate time for intervention. Which procedure is safe and efficacious?

Like any minimally invasive technique, VATS procedures have an associated learning curve. Once the learning curve is surpassed, complications are less likely to be prevalent and optimum results can be observed [3, 4]. Today use of VATS as a definitive therapeutic tool in pulmonary diseases is still under scrutiny. So this study was conducted to evaluate safety and efficacy of video assisted thoracoscopic surgery. We compared postoperative pulmonary function test, hospital stay and analgesic requirement for pain management postoperatively in VATS operated patients with age, weight and gender matched patients subjected to open Thoracotomy.

MATERIAL AND METHODS

This cross sectional study was conducted on patients with pulmonary disease presenting to the department of pulmonary medicine and department of surgery at KGMU, Lucknow.

Out of total 43 study patients, 20 Patients treated by VATS were included in Group-A and 23 patients treated by Open Thorcotomy were included in Group- B.

After written informed consent, general examination and respiratory system examination was done. Routine investigations like hemogram, bleeding time, clotting time, viral markers, blood sugar, X-ray chest**,** USG Thorax (if needed)**,**CT scan thorax (if needed)**,** Pulmonary function tests**,** Pleural fluid analysis were done**.**

Operative procedures: Thoracotomy was performed by making a 20-cm posterolateral incision through the fourth or fifth intercostal space, sparing the serratus anterior muscle. VATS was performed by making three incisions with rib sparing. Two incisions were used as 10-mm thoracoscopic ports, and the third was used as a 5-mm surgical instrument port. A 5-cm access was located anteriorly in the fourth or fifth intercostal space. Complete lymph node dissection was usually carried out along with VATS or thoracotomy. The surgical approach was chosen based on clinical attributes such as patient age, general condition, and pulmonary function. It was selected by the two attending thoracic surgeons who performed the operations.

Pulmonary function testing: Pulmonary function data of forced vital capacity. (FVC), forced expiratory volume in 1 second (FEV1), and peak flow rate (PFR), were collected before discharge from hospital and at 6 and 12 months postoperatively.

STATISTICAL ANALYSIS

The results are presented in frequencies, percentages and mean ± SD. Unpaired t-test was used for comparisons between two different groups. The p-value less than 0.05 were considered significant. All the analysis was carried out on SPSS 16.0 version.

RESULT

Table-1: Forced expiratory volume in 1st second in percentage of predicted

Duration	Group-A(n=20)		Group-B (n=23)		Statistical significance	
	Range	Mean SD	Range	Mean	"t"	"p"
Initial	33-51	42.40± 5.82	28-48	38.34± 7.30	1.991	0.053
1 month	44-71	57.20± 10.12	31-50	40.22± 6.13	3.752	0.001
3 months	48-75	61.67± 9.94	36-55	45.0± 6.24	6.097	0.001
6 months	53-82	69.05 ± 9.03	38-58	44.86± 11.64	7.342	0.001

Table-2: Vital capacity in percentage of predicted

Duration	Group-A(n=20)		Group-B (n=23)		Statistical significance	
	Range	Mean SD	Range	Mean	"t"	"p"
Initial	37-52	42.35± 4.89	33-53	40.21 ±5.04	1.402	0.168
1 month	46-79	62.10±12.82	41-60	49.39± 5.28	4.353	0.001
3 months	58-87	73.95±10.23	49-65	55.30± 6.32	7.294	0.001
6 months	60-90	47.10±10.49	52-69	61.83± 5.67	6.442	0.001

Table-3: Forced vital capacity in percentage of predicted

Duration	Group-A(n=20)		Group-B (n=23)		Statistical significance	
	Range	Mean SD	Range	Mean	"t"	"p"
Initial	38-51	45.15± 4.68	33-53	41.30± 6.02	2.312	0.02
1 month	60-74	68.10± 4.98	41-60	50.52± 6.89	9.456	0.001
3 months	70-84	79.80± 4.88	49-65	57.17± 5.08	14.833	0.001
6 months	74-86	79.20± 3.41	52-69	59.82± 5.79	13.106	0.001

Table-4: Peak expiratory flow in percentage of predicted

Duration	Group-A(n=20)		Group-B (n=23)		Statistical significance	
	Range	Mean SD	Range	Mean	"t"	"p"
Initial	38-53	44.45± 5.41	35-48	40.09±6.32	1.889	0.066
1 month	46-69	57.15± 7.46	36-52	45.53±5.50	5.859	0.001
3 months	70.35	70.35± 5.68	47-66	60.59±21.07	2.004	0.05
6 months	70-84	79.35± 3.45	49-70	59.26 ± 6.70	12.06	0.001

Table-5: Percentage improvement in mean of vital capacity

Group	One month	Three months	Six month
Group A	47.72± 31.41	76.09 ± 27.52	87.38± 35.71
Group B	24.13 ± 17.14	39.21± 21.37	55.24 ± 18.21
"t"	3.111	4.942	3.791
"p"	0.003	0.001	0.001

Table-6: Percentage improvement in mean of forced vital capacity

Group	One month	Three months	Six month
Group A	52.20± 17.84	78.25± 18.18	77.16± 19.23
Group B	24.47± 22.47	40.52 ± 18.53	47.73± 25.72
"t"	4.435	6.719	4.188
"p"	0.001	0.001	0.001

Table-7: Amount of Analgesic dose administered

Co-morbid condition	Group-A (n=20)		Group – B (n=23)	
	No.of patients	%	No. of patients	%
Tramadol (200-300 mg/day)	-	-	23	100
Ibuprofen (400-600 mg/day)	20	100	-	-

Table-8: Duration of hospital stay

s. no.	Group	Mean duration of hospital stay	Range
1	Group A	7.70± 0.979	7-10
2	Group B	17.17± 1.498	15-20

DISCUSSION

In group A, 18 patients were male and 2 patients were female. In group B, 22 patients were male and 1 patient was female. The difference between male and female may be because of prevalent sociocultural milieu which might cause the underreporting of the female patients to hospitals.

Among Group A, 13 (65%) patients were smokers and in Group B 19 (82.61%) were smokers. Both smoking + alcoholism was present in 4 (20%) subjects in group A and 5 (21.74%) subjects in group B, which have been proven to be common to association and aggravating factor for infections and chronic obstructive pulmonary disease.

In our study bronco-pleural fistula associated with empyma thoracics 60% remains the main cause. However, among the other causes 15% patients belongs to spontaneous pneumothorax (cause ruptured bullae). 15% patients had penetrating injury chest and 10% patient had lung abscess. Most common symptoms were cough with or without expectoration and breathlessness present in both groups of patients. Radiologically collapse of the affected lung was seen in all 43 patients. In Group A calcification was seen in 9 (45%) of subjects and in Group B 10 (43.48%) of subjects. These signs are associated with chest deformity and calcification was associated with poor functional recovery even after 6 months of intervention.

In Group A an improvement in mean of forced expiratory volume was seen of 37.15% at one month, 44.37% at three months and 58.84% at six months. In Group B improvement of 8.3% was seen at one month, 20.49% at three months and18.45% at six months. Thus statistically significant response was seen in Group A as compared to Group B.

In the pulmonary function tests forced vital capacity was found to be the most sensitive indicator for degree of restriction. Both Group A and Group B patients showed improvement in mean of forced vital capacity from one month to three months. In group and it reached from 52.2% to 78.25% while in Group B it reached from 24.47% to 40.52%. By the end of six months, the percentage improvement in mean of forced vital capacity reached to 77.16% in Group A and 74.79% in Group B. Statistically Group A showed a significantly better improvement as compared to Group B at all the three occasions i.e. one month, three months and six months.

Group patients showed an improvement in mean of forced expiratory flow of 29.48% at one month, 59.78% three months and 80.65% at six months and Group B patients showed an improvement of 46.34% at one month, 48.75% at three months and 92.11% at six months. Statistically significant improvement was seen in group A as compared to Group B at one month only. At three months and at six months there was no significant difference between the two groups. The peak expiratory flow was significantally higher in Group A than in Group B at one, three and six months.

Previous studies demonstrated that VATS better promoted the recovery of early postoperative pulmonary function than did conventional thoracotomy. Nakata showed better recovery of pulmonary function and oxygenation in patients receiving VATS compared with those receiving thoracotomy, as assessed on 4, 7, and 14 days after surgery[5]. Another study, which examined recovery up to 3 months after surgery, had a similar result.

Because VATS causes minimal injury to the chest wall, it causes less postoperative pain and physiologic stress than thoracotomy [6]. Post-operative pain and discomfort was drastically reduced in VATS

due to decreased tissue manipulation and avoidance of rib resection. In Group A mild pain was present in 18 (90%) and in Group B 14 (60.87%) and severe pain was present in only Group B patients 4 (17.39%). In Group A, the pain was controlled with the help of ibuprofen (400-600 mg/day) in all the 20 patients. However, in Group B pain was controlled only with Tramadol (200-300 mg / day) in all the 23 (100%) patients.

The duration of hospital stay in Group A patients was 7-10 days and in Group B 15-20 years. VATS treated patients were encouraged to go home early and taught self -irrigation of their tubes. Patient guides with dos and don'ts were provided and patient was encouraged to contact his local physician regularly. This domiciliary care reduced the hospital stay, cost of therapy and allowed gradual improvement of the patient in familiar surroundings. Early domiciliary therapy had an impact on the patient turnover, hospital resources and lead to increased bed availability. In the current era of health economics, a reduced length of stay equates to greater efficiency [7-9].

Long term follow up of patients showed relief from symptoms in 25 days in Group a (VATS) and 47 days in Group B (open thoractomy). Full functional recovery was achieved in majority of the patients in both groups with return to normal activity in 42 days in Group A (VATS) and 78 days in Group B. In Group A, the mean duration of hospital stay was 7.70 ± 0.979 days while in Group B the mean duration of hospital stay was 17.17± 1.498 days.

Bendixen *et al*. reported that "VATS is associated with less postoperative pain and better quality of life than anterolateral thoracotomy for the first year after surgery". Authors also reported shorter duration of epidural analgesia, less perioperative blood loss and shorter length of stay for the VATS group compared to the thoracotomy group [10].

CONCLUSION

From our study results we conclude that video assisted thoracoscopic surgery has been shown to be superior to open thoracotomy for the treatment of various pulmonary diseases such as spontaneous pnemothorax and bronchopleural fistula. The vital capacity was significantly higher in VATS operated patients than in open thoracotomy patients. The forced expiratory volume, forced vital capacity and peak expiratory flow in VATS operated patients were significantly higher than open thoracotomy patients. Postoperative pain was significantly less in VATS operated patients than open thoracotomy patients. VATS operated patients did not require narcotic drug for analgesia while open thoracotomy patients required Tramadol (200-300 mg a day) as analgesic.

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