Video-Assisted Thoracoscopic Surgery for Spontaneous Pneumothorax

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1. INTRODUCTION

Pneumothorax (PNTX) is the presence of air in the pleural cavity. It is associated with a partial or a complete collapse of the affected lung. It is said that pneumothorax is spontaneous in the absence of traumatic or iatrogenic factors (puncture, catheterization, ventilation, biopsy) (1).

Primary spontaneous pneumothorax (PSP) is characterized by the absence of clinically and radiologically recognizable lesions. This is the cause of one or several bladders ruptures (bullae). The development of computerized tomography in the last decades enabled a better appraisal of anatomic lesions frequency, which are associated with the spontaneous pneumothorax (2). The evolution of spontaneous pneumothorax is mostly benign, but it is marked with a lot of frequent recurrences which require a surgical treatment (3).

Thoracoscopy is an old surgical procedure. It is often used for diagnostic purposes. The evaluation of video materials and surgical instruments, and mastering technics of selective intubation in anaesthesia, gave this procedure the option of therapy treatment (4).

The surgical treatment of pneumothorax enables the reexpansion of lung parenchyma and normalization of lung function. It blocks the development of recurrence with a minimal hospitalization.

Video-assisted thoracoscopic surgery (VATS) has an aim to realize endothoracoscopic procedures, which are usually done by thoracotomy through the holes of size 1-2 cm (5,6). The treatment by video-assisted thoracoscopic surgery (VATS) is performed under a general anaesthetic including the selective intubation and it consists of three stages: the exploration, the treatment of bullae and pleurodesis. The aim of this study was to determine and compare the pain intensity, the length of surgical procedure, the number and type of postsurgical complications in patients treated with VATS, in relation to patients treated with thoracotomy.

2. PATIENTS AND METHODS

- This is a retrospective research including 100 patients with a spontaneous pneumothorax. The patients are divided into two groups:
  - The first group of 50 patients have been operated with VATS
  - The second group of 50 patients have been operated with thoracotomy

From January 1998 to January 2003, out of 134 patients who have been treated with VATS, because of primary spontaneous pneumothorax (PSP), at the Clinic for Chest Surgery the University Hospital in Strasbourg, the 50 patients were chosen at random. The patients were treated under general anaesthetic including the selective intubation with the Carlens tube. The patients with ASA III and ASA IV risk group were excluded.

At the Department of Chest Surgery UKC in Tuzla, from January 1998 to January 2005, out of 107 treated patients, 50 patients were chosen at random. They were treated with the standard thoractomy because of the primary spontaneous pneumothorax (PSP). The patients were treated under general endotracheotomic including the selective intubation with the Carlens tube. The patients with ASA III and ASA IV risk group were excluded.

In this study histories of disease were used. The patients from both groups were very similar considering profession, age, gender, smoking habits, the ethiology of pneumothorax and the appearance of bullae. All patient diagnosis is set based on clinical examination, chest radiography and confirmed by CT. All patients was done by the same surgical procedure on the lung parenchyma. We determined the length of surgical procedure, the pain intensity, the number and the type of postsurgical complications.

The statistical analysis results, we used the following tests: t-test, Mann-Whitney, Wilcoxon W, Kolmogorov-Smirnov Z and X² test. Statistical hypotheses were tested at the level of α=0.05.

ORIGINAL PAPER SUMMARY

Primary spontaneous pneumothorax (PSP) is a benign disease frequently found in younger and healthy-looking persons. It requires a surgical treatment in about 30-40% of cases. Video-assisted thoracoscopic surgery (VATS) has been recently introduced as a reliable alternative method to the classic thoracotomy. The aim of this paper is to establish and compare the length of surgical procedure, pain intensity, number and kind of postsurgical complications during the procedure for the patients with PNTX treated by VATS in relation to the patients with PNTX treated by thoracotomy. This is a retrospective study. The patients are divided into two groups: the first group of 50 patients treated with VATS and the second group of 50 patients treated with thoracotomy. The results obtained show a significantly shorter surgery duration in...
3. RESULTS

The average length of surgical procedure in the VATS group and thoracotomy group is illustrated in the table 1.

<table>
<thead>
<tr>
<th>O/min</th>
<th>VATS group</th>
<th>Thoracotomy group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>X</td>
<td>71,70</td>
<td>102,70</td>
</tr>
<tr>
<td>S</td>
<td>15,19</td>
<td>17,63</td>
</tr>
</tbody>
</table>

**Table 1.** The length of surgical procedure (o) in minutes

It has been established that there is a statistically significant difference in the length of surgical procedure between two target groups (p<0.001, Wilcoxon W test and K-S Z-test). The postsurgical pain intensity in the VATS group and the thoracotomy group is illustrated in the table 2.

<table>
<thead>
<tr>
<th>The pain intensity (%)</th>
<th>VATS group</th>
<th>Thoracotomy group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>74,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Intense</td>
<td>22,00%</td>
<td>26,00%</td>
</tr>
<tr>
<td>Severe</td>
<td>4,00%</td>
<td>32,00%</td>
</tr>
<tr>
<td>Intolerable</td>
<td>0,00%</td>
<td>42,00%</td>
</tr>
<tr>
<td>Total</td>
<td>100,00%</td>
<td>100,00%</td>
</tr>
</tbody>
</table>

**Table 2.** The intensity of postsurgical pain

The postsurgical pain intensity of target groups during the postsurgical state shows a statistically significant difference (p<0.001, \( \chi^2 \) test).

The postsurgical complications in the VATS group and the thoracotomy group are illustrated in the table 3.

<table>
<thead>
<tr>
<th>Complications (%)</th>
<th>VATS group</th>
<th>Thoracotomy group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bleeding</td>
<td>11,11%</td>
<td>5,88%</td>
</tr>
<tr>
<td>An extended loss of air on the drain &gt; 7 days</td>
<td>33,33%</td>
<td>29,41%</td>
</tr>
<tr>
<td>An incomplete lungs reexpansion</td>
<td>22,22%</td>
<td>35,29%</td>
</tr>
<tr>
<td>The treated wound infection</td>
<td>0,00%</td>
<td>11,76%</td>
</tr>
<tr>
<td>The lungs infiltration</td>
<td>11,11%</td>
<td>17,65%</td>
</tr>
<tr>
<td>Sy Claude Bernard-Homer</td>
<td>11,11%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Recurrence</td>
<td>11,11%</td>
<td>0,00%</td>
</tr>
<tr>
<td>Total</td>
<td>100,00%</td>
<td>100,00%</td>
</tr>
</tbody>
</table>

**Table 3.** The postsurgical complications

The results achieved show that the target groups concerning the phenomenon of surgical complications do not exhibit any statistically significant differences (p>0.05, \( \chi^2 \) test).

4. DISCUSSION

The length of surgery duration differs significantly in target groups. Video-assisted thoracoscopic surgery takes less time for intrusion in pleural cavity and it enables faster and easier closing of surgical incision (7,8,9). It is important to emphasize that the already existing incisions are used for drains placement while with classical thoracotomy drains are performed on special incisions (10). An average length of surgery duration in VATS group lasted 71,7 minutes while in thoracotomy group it lasted 102,7 which is a better match with the research of other authors. It has been proved that a statistically significant difference exists in the length of surgery between the two target groups (p<0.001, Wilcoxon W test and K-S Z-test). The estimated postsurgical pain level has always been a challenging topic for discussions. A significant reduction in postsurgical pain is explicit when a reduced surgical trauma is directed towards the chest wall, and especially when surgery procedure does not include ribs (11). The estimation could be located on a subjectively analogical scale or on the base of quantity and quality of analogistics that are being used. According to the works, a personal perception of postsurgical pain varies from patient to patient and it depends on many factors. Similarly, the perception of pain is different from one to the other surgical team. However, taking into consideration patients who used to be treated with classical thoracotomy on one side, and then with video-assisted thoracoscopic surgery on the other side because of bilateral pneumothorax, no doubt that VATS is procedure considerably less painful (12,13). VATS procedure provides less postsurgical pain because it skips section of the muscles from one side and spread the ribs from the other side. After VATS, patients have pain as a result of drains presence; after they are taken out, the pain almost disappears. According to the works of many authors, the intensity of this pain depends directly on the size of trocar used during the procedure. The patients who had a very intense to unbearable pain in groups treated with video-assisted thoracoscopic surgery have most likely had lesion intercostal nerve by using a big trocar. On the other side, after thoracotomy, the pain is inclusively related to surgical incision and spread the ribs (14). Anatomical localization of intercostal nerves makes them sensitive to mechanic forces, especially if they don’t last for a long time. A long-term pain is a disturbing problem for a surgical team. This pain, sometimes very intense or unbearable, does not change with regards to body position or presence of drains. Along with dyspnea, it significantly prolongs hospitalization because it impeding a normal breathing cycle. Extraction of drains does not significantly lower the pain intensity.

In the treatment of postsurgical pain with patients treated with VATS method, the pain was effectively controlled with Acetaminophen while with the patients treated with thoracotomy the pain was controlled with sedative analgesics or opiates (11). This treatment with analgetics was especially noted in the first 48 hours. Many authors indicate a significantly lower level of pain after VATS in comparison with thoracotomy: 82% of patients have a moderate to intense pain versus a very intense to an unbearable pain with 72% patients in group who had thoracotomy (7,8,9,15). In our study we confirmed similar results; in VATS group 96% of patients had a moderate to an intense pain in comparison to thoracotomy group where 74% of patients had a very strong to an unbearable pain. The intensity of post-surgical pain in target groups shows a statistically significant difference (p<0.001, \( \chi^2 \) test).

Complications after post-surgical durations are noted in both groups (6, 10). The loss of air on thoracal drains is usual during the first few days although stapled line of resection is considered as perfect. The loss of air disappears after five days. However, if the loss of air continues 7 days after surgery, we refer to an extended loss of air. The most frequent reasons lie in a poorly placed stapled line of resection and not in quality of pleural parenchym. Sometimes, it’s very difficult to estimate macroscopically the border of bulous lesion and healthy parenchym. While trying to save as much as possible of the rest of healthy part, a stapler is sometimes applied partially on the pathologically changed place which interferes with the process, and it manifests itself by an air fistula. In both groups, this complication is resolved in a conservative way.

I both groups, the case of post-surgical bleeding is noted. In VATS group, it had to do with interpleural bleeding with a consequential hematothera.
Video-Assisted Thoracoscopic Surgery for Spontaneous Pneumothorax

rax which is treated by adding dissolution streptokinase over the existing drains. In thoracotomy group, bleeding had to do with a week hemostasis in the chest wall. An incomplete re-expansion of pleural parenchym and infiltration of lungs are very frequently joined. A smaller number of complications in VATS group had to do with a faster healing of functional spirometric parameters (a forced expiratory volume in the first second of vital capacity).

In the group of patients treated with VATS a case was noted with a discrete and lasting eyelid ptosis. It fits a pleural abrasion in the area of the lung top and the lesion of sympathetic strings of ganglion stelatum. After 4 months in VATS group, the relapse is treated with classic thoracotomy.

Comparing the number and kind of complications, we can see that they are by volume and kind very equalized (8,11,14,15). The greatest number of these complications in both procedures are temporary and most frequently are related to intensity of post-surgical pain. The results obtained show that the targeted groups in the occurrence of post-surgical complications do not illustrate a statistically significant difference (p>0,05).

5. CONCLUSION

VATS is characterized by a short-term surgical timing realized on the basis of a faster input and output from the pleural cavity, as well as a facilitated drainage. The analyzed data show that the pain intensity directly influences on recovery speed, postsurgical complications occurrence and hospitalization period. The pain intensity and quality at patients treated with VATS are considerably lower and their treatment is more effective. The postsurgical complications are proportional to the trauma scope done on the chest wall and not on the lungs parenchyma.

REFERENCES


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