Research on short-term curative effect of VATS-assisted NUSS procedure in treating PE

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ABSTRACT

Objective: To study the short-term curative effect and the occurrence of postoperative complications of VATS-assisted NUSS procedure in treating congenital pectus excavatum (PE).

Methods: 96 patients with congenital PE admitted into our hospital from March, 2008 to June, 2014 were chosen and divided into the study group and the control group randomly. Patients in the study group received VATS-assisted NUSS procedure while patients in the control group were treated with traditional NUSS procedure. Blood pressure, heart rate, operating time, blood loss, the length of hospital stay and ICU stay of all the patients during perioperative period were recorded. And a three-month follow-up was performed to record the short-term curative effects and the occurrence of postoperative complications.

Results: The operating time, blood loss, length of hospital stay of the study group were remarkably less than those of the control group (P<0.05), while no significant differences were observed between two groups in blood pressure, heart rate or the length of ICU stay (P>0.05). The excellent and good rate of curative effect and the total score of M-SSQ of the study group were significantly higher than those of the control group (P<0.05), while the occurrence of postoperative complications of the study group was significantly lower than that of the control group (P<0.05).

Conclusions: With better short-term curative effect and less postoperative complications, VATS-assisted NUSS procedure could be regarded as a reliable and effective therapy for congenital PE.

1. Introduction

Congenital Pectus Excavatum (PE), also known as thoracic sunken deformity, is a common congenital deformity of the anterior wall of the chest. PE patients tend to suffer severe thoracic deformity that constricts lung and heart to varying degrees, even resulting in heart displacement and decline of life qualities. NUSS procedure, introduced in the early 1990s, is a minimally invasive repair for treating PE, which has brought hope to PE patients worldwide. However, traditional NUSS procedure couldn’t be performed successfully without the assistance of thoracoscope, and relatively more postoperative complications would occur. As a procedure for intrathoracic diseases, video-assisted thoracoscope surgery (VATS) is able to widen the visual field of operation and invasions could be minimized. In this study, a total of 96 PE patients admitted into our hospital from March 2008 to June 2014 for above-mentioned procedures were chosen so as to study the short-term curative effect of the VATS-assisted NUSS procedure in the treatment of PE. The report concludes as follows.

2. Materials and methods

2.1. Clinical materials

A total of 96 congenital PE patients admitted into our hospital from March 2008 to June 2014 were selected, including 75 males and 21 females, aged from 3 to 15 with the average age of (12.7±10.2). Inclusion criteria was as follow: 1) CT number \( >3.20 \); 2) with pulmonary dysfunctions such as restrictive ventilatory disorder and
poor vital capacity; 3) with cardiac dysfunction including incomplete right buldle-branch block and mitral valve prolapse shown by electrocardiogram; 4) with the exacerbation of deformity; 5) with the relapse of congenital PE; 6) experience severe psychological damage and strongly demand repair. Patients who apply two or more conditions were included. Patients with severe primary diseases in other systems or mental disorders, those with sunken anterior chest wall resulted from surgery for congenital heart disease or trauma, as well as those who are uncooperative were excluded.

2.2. Methods

96 patients were divided into the study group (n=47) and the control group (n=49) by random. Patients in the study group received VATS-assisted NUSS procedure which was performed as follows: The patient was put in the supine position with chest slightly elevated after general anesthesia. A mark was made at the crest of the depression, and incisions were made at the cross points of transventile line extended from the mark and the bilateral mid-axillary lines, and then took apart along the subcutaneous tissue. The length of the incisions was 2 cm to 3 cm approximately. Afterward, at the axillary frontline of the right incision, a incision with the length of about 0.5 cm was made, through which a small amount of carbon dioxide was passed into so as to create artificial pneumothorax and the VATS was implanted. Under the monitoring of thoracoscope, a guide-line device was implanted through right incision and it went slowly through sternal depression, mediastinum and pericardium, and then went out through the left incision. A prepared supporting metal bar was connected to the guide device with a string and was implanted into the sternum through the tunnel of guide device. The bar was rotated to make the convex surface upward once in place to elevate the depression. And it was put into a fixation and sutured onto the muscle and ribs. Carbon dioxide was emitted when there was no active bleeding and the supportive metal bar was in perfect position. After the implant of a closed thoracic drainage tube in the incision of the thoracoscope, incisions were sutured inside-out. Patients in the control group received traditional NUSS procedure which was performed in accordance with the standard NUSS procedure strictly.

2.3. Observation items

The blood pressure, heart rate, operation time, blood loss, length of hospital stay and ICU stay of both groups during the perioperative period were recorded and a 3-month follow-up was performed to record the short-term curative effect and postoperative complications. Patients have filled the research chart of M-SSQ. The curative effect was assessed in the four classes: excellent, good, improved, and poor. 1) thoracic cosmetic outcome; 2) the sternum improvement shown by chest X-ray; 3) thoracic stretchousness, plumpness and flexibility; 4) the satisfaction degree of patients and their relatives. Patients applied to 4 conditions that would be excellent, 3 conditions good, 2 conditions improved, 0-1 condition poor.

2.4. Statistical method

Data were analyzed by using SPSS17.0 software. \( \chi^2 \) test was performed for enumeration data while t-test was adopted for measurement data, with statistical difference setting at \( P<0.05 \).

3. Results

3.1. Comparison of patients during perioperative period

Group patients perioperative blood pressure, heart rate, operation time, intraoperative blood loss, hospital stay, duration of ICU stay were (80.3±7.2) mmHg and (70.3±5.3) times/min, (48.7±8.4) min and (8.4±3.6) mL, (5.2±1.7) d, (9.8±3.2) h; The control group were (77.5±8.2) mmHg and (69.5±4.8) times/min, (59.8±7.5) min and (7.5±4.2) mL, (7.6±1.2) d, (1.2±2.5) h. The operating room time, blood loss, average length of hospital stay of the study group were significantly lower than those of the control group \( (P<0.05) \), while no significant differences were observed in blood pressure, heart rate and length of ICU stay between two groups \( (P>0.05) \). (See in table 1).

3.2. Assessment of M–SSQ scores

The M-SSQ total score of the study group and the control group was (69.8±5.2) and (56.2±6.5) respectively. The score of the study group was significantly higher than that of the control group \( (P<0.05) \). Though no statistical differences were observed between two groups before surgery \( (P>0.05) \), post-operative scores for each item improved significantly \( (P<0.05) \). After surgery, the scores of self assessment and general health condition of the study group were significantly higher than those of the control group \( (P<0.05) \). (See in Table 1).

Table 1.

<table>
<thead>
<tr>
<th>M-SSQ assessment results.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
</tr>
<tr>
<td>Study group</td>
</tr>
<tr>
<td>47</td>
</tr>
<tr>
<td>Control group</td>
</tr>
<tr>
<td>49</td>
</tr>
</tbody>
</table>

Notes: compared with preoperative \( P<0.05 \); compared with continue group \( *P<0.05 \)

3.3. Comparison of post-operation curative effects

Team evaluation after treatment of instituting 17 cases (36.2%), benign and 22 cases (46.8%), 6 cases (12.8%), 2 cases (4.3%), the rate of good curative effect was 83.0% (39/47); The control group respectively for 11 cases (22.4%), 19 cases (38.8%), 15 cases (30.6%), 4 cases (8.2%), fine rate was 61.2% (30/49) of therapy, observation group is significantly higher than the control group, compare the difference between groups was statistically significant \( (P<0.05) \). The excellent and good rate of curative effect of the study group was 83.0% (39/47), while that of the control group was
61.2% (30/49). The excellent and good rate of the study group was significantly higher than that of the control group, and statistical significances were observed between two groups \((P<0.05)\).

### 3.4. Comparison of complications

The occurrence rate of postoperative complications in the study group was 12.7% (6/47), while that in the control group was 28.6% (14/49). The occurrence rate of postoperative complications in the study group was significantly lower than that in the control group \((P<0.05)\). (See in table 2).

#### Table 2 Comparison of postoperative complications.

<table>
<thead>
<tr>
<th>Groups</th>
<th>(n)</th>
<th>Pneumothorax</th>
<th>Subcutaneous emphysema</th>
<th>Hemorrhax</th>
<th>Wound infection</th>
<th>Pleural effusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>The study group</td>
<td>47</td>
<td>3(6.4)</td>
<td>1(2.1)</td>
<td>1(2.1)</td>
<td>1(2.1)</td>
<td>0(0.0)</td>
</tr>
<tr>
<td>The control group</td>
<td>49</td>
<td>6(12.3)</td>
<td>4(8.2)</td>
<td>1(2.0)</td>
<td>0(0.0)</td>
<td>3(6.1)</td>
</tr>
<tr>
<td>(z^2)</td>
<td></td>
<td>0.241</td>
<td>0.187</td>
<td>0.115</td>
<td>0.132</td>
<td>0.166</td>
</tr>
<tr>
<td>(P)</td>
<td></td>
<td>&lt;0.05</td>
<td>&lt;0.05</td>
<td>&gt;0.05</td>
<td>&gt;0.05</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

### 4. Discussion

Congenital PE occurs in approximately from 1 in every 1000 births to 1 in every 400 births, with males afflicted 3 to 5 times more often than females. PE patients tend to suffer severe anterior chest wall deformity which constricts lung and heart, resulting in weakening of cardio-pulmonary function and poor life qualities. Therefore, this research aims to study the short-term curative effect and the occurrence of postoperative complications of VATS-assisted NUSS procedure in treating congenital PE, in hope to find a better therapy. Compared with traditional procedure, VATS is characterized with minimal incisions, less pain, shorter hospital stay, quicker recovery and higher cosmetic satisfaction. With these advantages, it has widened surgical range and indications and will especially benefit weak senior patients as well as those with poor cardiopulmonary function. Additionally, only small transverse incisions with the length of 2 cm to 3 cm in the bilateral mid-axillary lines shall be made, instead of incision of anterior chest wall or sternum osteotomy, making the surgery less difficult and shorter, less harm would be done to the patients and less intraoperative blood transfusion are ensured. With fewer anesthetics in NUSS procedure, patients can come into conscious sooner after the surgery, which ensures shorter ICU stay. As a minimally incisive surgery, NUSS procedure guarantees quicker recovery and shorter hospital stay. It is concluded that VATS-assisted NUSS procedure has a better curative effect and lower occurrence rate of complications in the treatment of congenital PE, and less harm would be done to patients. The results of this study showed that the operating time, blood loss, average length of hospital stay of the study group were significantly lower than those of the control group \((P<0.05)\), and no significant differences were observed between two groups in blood pressure, heart rate and length of ICU \((P>0.05)\). The postoperative excellent and good rate of curative effect of the study group was significantly higher than that of the control group, demonstrating that VATS-assisted NUSS procedure would bring better curative effects than traditionally NUSS procedure. The total M-SSQ median score of the study group was significantly higher than that of the control group \((P<0.05)\), and the postoperative complication rate of the study group were significantly lower than that of the control group \((P<0.05)\), demonstrating that VATS-assisted NUSS procedure, with significant short-term curative effect and less postoperative complications, is safe and reliable. Study reveals that VATS-assisted NUSS procedure is safe, effective and worthy of promotion and application for the future due to it significant short-term curative effect and less postoperative complications.

### References


[9] Li ZW, Surgical Treatment and Development of PE. Zhengzhou University 2011.


