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Uniportal VATS for pectus excavatum: the Southern Switzerland experience

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Abstract. – OBJECTIVE: The Nuss procedure is a minimally invasive approach used to treat the pectus excavatum. One to three curved metal bars are inserted behind the sternum in order to push it into a normal position. A bilateral thoracoscopy, with 3 or 4 incisions on each side, has been reported as a safe method to repair the chest. The aim of this observational cohort study is to evaluate the safety and efficacy of the modified uniportal thoracoscopic Nuss procedure.

PATIENTS AND METHODS: A retrospective review on 248 consecutive patients treated in Southern Switzerland in the last 5 years for chest deformity was performed. Conservative treatment with vacuum bel or dinamic compression was performed in 235 cases. Thirteen patients with pectus excavatum were surgically treated with a modified single-incision thoracoscopic approach and introduction of a single retrosternal Nuss Bar. Demographics, clinical characteristics, surgical data and results were analyzed and discussed.

RESULTS: The male/female ratio was 11/2, with mean age of 20.75 (±5.05) years. The Haller index was 3.65±0.5. The operative duration was 68. 2±13.3 min and hospitalization stay ranged from 2 to 10 days. There was no instance of intraoperative cardiac perforation or macrovascular injury. No pleural effusion or infection was reported. The overall complication rate after a postoperative follow-up of 24.6±3 months was 7.6%, without mortality, major bleeding, infectious complications, displacement or recurrence. Patients satisfaction and postoperative pain were also analyzed.

CONCLUSIONS: The modified single-incision thoracoscopic Nuss procedure is both safe and effective for pectus excavatum correction with non-recurrence after two years.

Key Words:
Nuss procedure, Uniportal VATS, Pectus excavatum.

Introduction

Pectus excavatum is a congenital chest wall deformity and surgical correction is still considered the standard of care. In 1998, Nuss et al[1] documented a method for the correction of pectus excavatum with good results. Despite universal acceptance, the procedure has several postoperative complications (about 10%-50%), including rare life-threatening complications[2-5]). The risk of complications increases with patient age or with the use of more than one pectus bar[4,5]. Several surgical technique modifications have been introduced in order to minimize the risks. The application of the thoracoscope in Nuss repair demonstrated an increased safety of the operation[6-8]. The video-assisted bilateral thoracoscopic approach – with 3 or 4 incisions – permit direct inspection and facilitate mediastinal dissection while eliminating the risk of cardiopulmonary injuries[8]. Uniportal VATS, also known as single-incision thoracoscopic surgery, has gained popularity in the past decade. Rocco et al[9] published the first case series of uniportal VATS pulmonary wedge resection in 2004. Since then, uniportal VATS has been successfully performed for numerous indications, such as diagnostic procedures or sympathectomy, but also more complication procedures, such as anatomic resection of the lung. An observational cohort study of patients with pectus excavatum after surgical correction with a modified single incision approach was performed.

Patients and Methods

All patients who underwent the modified uniportal VATS Nuss procedure in the last 5 years were included. The primary indications

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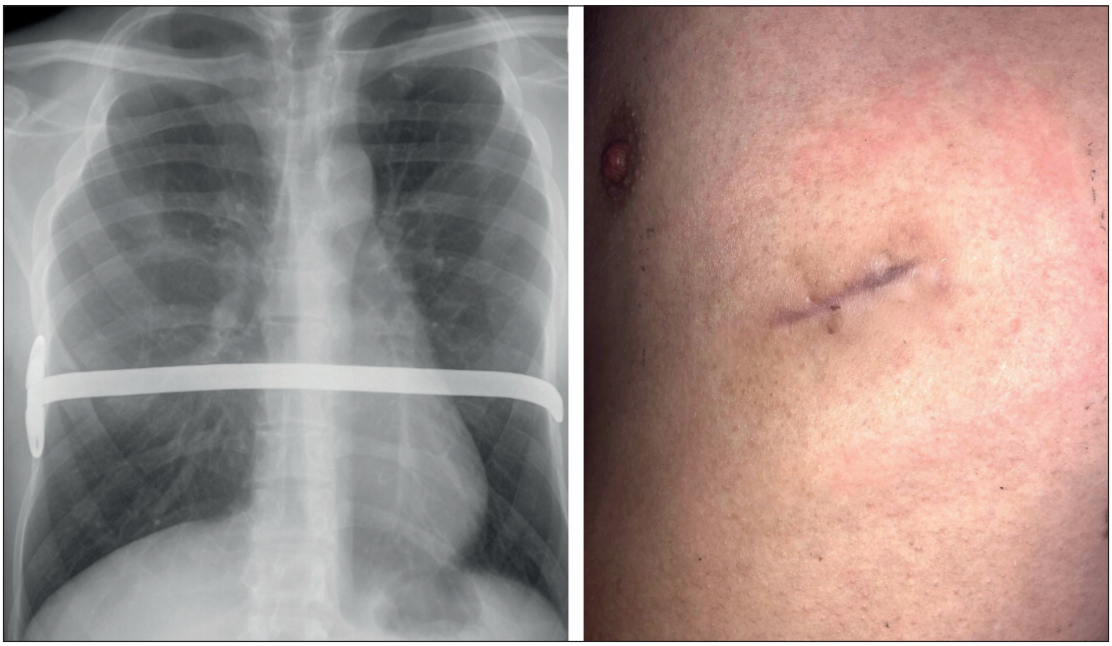

Figure 1. Bar placed and final cosmetic result.

for surgical repair were presence of one or more of the following criteria: (1) progression of the deformity; (2) exercise intolerance; (3) progressive chest pain or dyspnea; (4) restrictive ventilatory impairment; (5) HI >3.25; (6) cardiac compression. According to these criteria, 13 patients (M/F 11/2) underwent a modified bilateral uniportal VATS Nuss procedure. In order to minimize the risk of cardiac and vascular injury, the bar was inserted through one single incision (2 cm) only after that a mediastinal left-to-right retrosternal tunnel was performed under direct view. A small-drainage was inserted into each pleural space using the same incisions. After extubation and after drain removal, all patients underwent postoperative radiography (Figure 1), the VAS score and satisfaction questionnaire were collected at the discharge time. Demographics, clinical characteristics, surgical data, and results were analyzed and discussed.

Results

The demographic and preoperative clinical characteristics of our patients are shown in Table I. At least one preoperative symptom was found in all patients. More than 80% of patients were male; the population had a BMI of 20.4 (±2.3) and was older than 20 years (20.75 ±5.05). The mean Heller Hindex was 3.65±0.5. Perioperative characteristics and overall complications are summarized in Table II. The VAS pain score at the discharge time was 1.4 (±2.13). All patients were regularly followed up for at least 6 months postoperatively with the last follow-up at the time of removing Bar time at 24 months. The overall complication rate was 7.6%, with one case of prolonged pain.

A satisfaction questionnaire (1. not satisfied; 2. satisfied; 3. very satisfied) was administered to all patients after removing the bar, and 7.6% answered 1, while the other 92.4% answered 2 or 3.

Table I. Preoperative clinical characteristics.

Characteristic	
Mean age, years, mean ± SD	20.75 (± 5.05)
Gender, male, n (%)	11 (84.6)
BMI, mean ± SD	20.4 (± 2.3)
Symptoms (including chest discomfort/pain and anxiety), n (%)	13 (100)
Heller Index, mean ± SD	3.65 (± 0.5)

Table II. Perioperative characteristics and overall complication.

Characteristic	
Operative time, min, mean ± SD	68. 2 (± 13.3)
Implanted bar(s), n (%)	13 (100)
1 more	0 (0)
Complications n (%)	1 (7.6)
Reoperation for bleeding	0 (0)
Bar infection or displacement	0 (0)
Prolonged pain	1 (7.6)
Cardiac perforation	0 (0)

Discussion

The use of bilateral thoracoscopy has been reported in both children and adults to facilitate the safe passage of the support bar between the sternum and pericardium[10-13]. According to some authors, blind manipulation causes fatal complications, and thoracoscopic guidance is extremely important while guiding the introducer across the anterior mediastinum[14,15]. There are some centers that advocate routine usage of subxiphoid incision in place of thoracoscopy[16,17]. They advocate the usage of finger guidance through a subxiphoid incision to pass the support bar under the sternum. Bilateral thoracoscopy without subxiphoid incision is the reliable method and the modified uniportal VATS procedure seems to be the normal evolution of this approach. To the best of our knowledge, just a small number of cases (less than 100) are available in the literature[18-20]), and our series could be able to give a contribution for future systematic reviews and possibly to the diffusion of the technique.

Conclusions

Modified single-incision thoracoscopic Nuss procedure is both safe and effective for pectus excavatum with great the advantages in terms of shorter operative duration, mini-invasiveness, fewer complications, and excellent cosmetics and it is worthy of wider popularization.

Conflict of Interest

The Authors declare that they have no conflict of interests.

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