

# Thoracoscopic splanchnicectomy in chronic epigastric visceral pain therapy

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## Abstract

**Background:** The rapid development of minimal invasive surgery in the 1990s coincided with the introduction of videothoroscopic splanchnicectomy of nerve fibers engaged in the sensation of chronic pain related with advanced cancer. This study was aimed to determine pain intensity in patients with advanced cancer in the epigastric region before and after thoracoscopic splanchnicectomy.

**Material and methods:** The thoracoscopic splanchnicectomy was performed in 33 patients aged 42 to 77 from 2001 to 2005. Patients with chronic epigastric pain due to advanced cancer were qualified for the surgery. The pain intensity was ranked with Prince Henry Hospital Pain Scale (PHHPS).

**Results:** Even though all study patients were on continuous analgesic medications, the mean pain intensity in PHHPS scale was 2.67 points. Two days and thirty days after the surgery, the pain was ranked 1.28 and 1.57, respectively. All patients decreased the doses of their analgesic medication and seven of them entirely discontinued analgesic therapy.

**Conclusions:** The thoracoscopic splanchnicectomy is well suited, although relatively little known, method of the therapy of chronic pain in advanced malignancy. It may be recommended as an option in the current palliative analgesic therapy.

**Key words:** videothoracoscopy, pain management, thoracoscopic splanchnicectomy, pancreatic cancer.

## Introduction

The first laparoscopic splanchnicectomy surgery with spectacular visceral pain control effects was performed by Mallet-Guy in 1943 [1]. It took nearly fifty years when the effects of the surgery were confirmed by Ston and Chauvin in their 1990 paper on the excision of suprarenic part of the celiac nerve within the pleural cavity from thoracotomy access [2]. In 1993, Melki et al. pioneered in the thoracoscopic splanchnicectomy in a patient with pancreatic cancer invading the celiac plexus [3]. Later, in 1990 s breakthrough in minimal invasive surgery, thoracoscopic splanchnicectomy on both sides of the pleural cavity significantly improved chronic pain control in pancreatic, stomach, gallbladder and liver cancer [4, 5]. The celiac plexus is formed by the fibers descending from VI to IX thoracic ganglions. The superior fibers may originate higher or even in the first thorax ganglion. This nerve is located downwards along vertebral trunks spreading fine

branches towards descending aorta, penetrates through phrenic branch at the right side accompanying the inferior caval vein, and at the left side through aortic hiatus terminates mainly at the celiac plexus but also in the aortorenal plexus and suprarenal gland. If it reaches directly the renal plexus, it is connected with celiac branches. Fibers terminating in the kidneys most likely originate at the level of X-XII thoracic ganglions. At the level of XI or XII thoracic vertebrae, a small celiac nerve ganglion is located on the course of this nerve. Celiac nerve minor is made up from fibers from IX and X, or sometimes X and XI thoracic ganglions as well as fibers leaving at the interganglionic parts of the major nerve trunk. The nerve penetrates through the diaphragm together with celiac nerve major and reaches the aortorenal plexus. Sometimes its fibers form a synapse within the celiac plexus, and the postsynaptic fibers form the renal plexus; these fibers have vasoconstrictive properties. Also, sometimes part of the nerve fibers reach the inferior mesenteric plexus. The celiac nerves consist predominantly from myelinated, presynaptic as well as afferent fibers. The later ones conduct pain sensation from the region of peritoneum visceral organs and constitute efferent part of visceral reflexes. These efferent fibers, mainly presynaptic in majority do not form synaptic junctions within sympathetic ganglions, preceding through visceral nerves they form. The presynaptic nerve fibres reach target synapses in the celiac plexus and other abdominal plexuses. The impulses in celiac nerves constrict the mesenteric vessels, decrease peristaltic and increase sphincter tension. The efferent branches of vertebral plexuses conduct pain sensation from some abdominal organs [6, 7]. The partial excision of celiac nerves causes the reverse reaction compared with the one described above what has been a foundation in this study.

This study was aimed to determine pain intensity in patients with advanced cancer in the epigastric region before and after thoracoscopic splanchnicectomy.

### Material and methods

From 2001 to June 2005, thoracoscopic splanchnicectomy was performed in 33 patients, 22 males and 11 females, aged 42 to 77. The surgery was bilateral in 8 patients, left-sided in 19 and right sided

in 6 of them. The principal indication was chronic, epigastric pain caused by advanced stage malignancy. There were 22 patients with pancreatic cancer, 3 patients with gallbladder cancer and 8 with diffuse malignant infiltration in the stomach. Patients underwent surgery following cardiological and anaesthesiological consultation, under general tracheal anaesthesia with bronchial intubation with double lumen pipe allowing for a brief break in pulmonary ventilation at the side of the excised celiac nerve. The patient was lying on the opposite side to the operated on, and after preparation of the surgical site, the first trocar was inserted in the fifth intercostal space in the anterior axillary line. The remaining two trocars were inserted into the pleural cavity under videothoracic control in the fifth intercostal space in the posterior axillary line and in the seventh intercostal space in the middle axillary line. Lung parenchyma was pressed to visualize the vertebral area and celiac nerve located beneath the pleura surface. The parietal pleura was incised at the length of 5-10 cm upward from the diaphragm for the preparation and excision of the nerve with all its sympathetic trunk branches at the length of 5-10 cm. The surgery was completed after insertion of a pleural drainage for 24-48 postoperative hours, then the drainage was removed and lung was expanded. The time of the surgery itself was from 20 to 60 minutes, mean 41 minutes.

The pain intensity was ranked with point Prince Henry Hospital Pain Scale (PHHPS) before the surgery and a day after removal of the pleural drainage as well as one month after the surgery. The study patients were administered both narcotic analgesics and NSAIDs prior to the surgery. PHHPS scale is presented in Table I.

### Results

The effects of thoracoscopic splanchnicectomy were evaluated in 33 hospitalized patients and in 31 of them one month after the surgery. Based on the data from the study questionnaire, it was found that before the thoracoscopic splanchnicectomy all patients suffered from epigastric pain despite the continuous therapy with analgesic drugs. In the selected group, pain was ranked at 3 points according to PHHPS scale in 26 patients (78%). On the average, all patients before the surgery ranked their pain at 2.67 points. Based on the data from the questionnaire two days after surgery and after the removal of the

Table I. Prince Henry Hospital Pain Scale

Is there a spontaneous pain?	Yes	3 points
Is there a pain at the top of deep inspiration?	Yes	2 points
Is there a pain during coughing?	Yes	1 point
Response to these questions	No	0 points

pleural drainage, the epigastric pain was decreased and ranked 1.28 points according to PHHPS, even though it was still in an early postoperative period. At the follow-up examination one month after the surgery, 31 study patients ranked their epigastric pain at the average of 1.57 points according to PHHPS. Among these patients, as many as 7 subjects no longer continued the therapy with narcotic analgesics, the therapy was discontinued after the surgery and it was not required 30 days thereafter. The remaining patients were able to decrease significantly the doses of their analgesic medications. There were no complications of thoracoscopic splanchnicectomy surgery in any of the study patients within the observation time period.

## Discussion

The attenuation or termination of chronic pain has been a serious medical challenge especially in advanced stages of abdominal malignancy for many years [4, 5, 8]. Excision or destruction of nerve fibers in the celiac plexus was demonstrated to decrease pain significantly [8]. Before the 1990s, the access to the celiac nerve or plexus was achieved mainly with thoracotomy or laparotomy. These types of surgery were apparently related with the increased risk of complications in patients with advanced malignancy and therefore their indications were markedly limited [9]. Also, the procedures of ethanol or phenol induced celiac plexus damage were not successful. Their efficiency was too low and the procedures had to be repeated numerous times with the increased risk of iatrogenic complication [10]. The more common and less invasive videothoroscopic method was indeed a breakthrough in the modern thoracic surgery [3]. The videothoracic procedures also included splanchnicectomy performed to terminate impulsion in celiac nerves. Many surgical centers perform splanchnicectomy bilaterally at a time assuming that the impulsion is terminated entirely this way [11, 12]. In the current study, splanchnicectomy was performed unilaterally based on preoperative clinical symptoms and the side of more intense epigastric pain. The similar pattern of preoperative management was approved by other authors providing descriptions of thoracoscopic splanchnicectomy and suggesting that the surgery on the opposite side should be performed only in patients without any improvement after the first intervention [4, 8]. The consecutive surgery was performed in 8 patients in our study.

The intraoperative identification of the celiac nerve may be sometimes quite troublesome, especially in the patients with excess fat tissue beneath the parietal pleura. Moreover, some authors state that the additional excision of the sympathetic trunk with the celiac nerve ensures the complete excision and provides improved postoperative effects. This was

exclusively termed sympathetic splanchnicectomy [13, 14]. In the total of 33 surgeries in our center, we did not perform the excision of the sympathetic trunk, limiting the surgery to the precise separation of celiac nerve junctions with sympathetic trunk, with an excellent therapeutic outcome.

It should be further emphasized that thoracoscopic splanchnicectomy is a surgery performed in patients in serious general condition, with intense pain syndromes associated with advanced cancer infiltrating the celiac plexus. As a minimally invasive surgical method, it reveals a remarkable suffer and improves the quality of life [4, 15]. This method allows for discontinuation or marked decrease of dosage of potent analgesic drugs with numerous systemic side effects [4, 8, 11]. This effect was noted also in our study patients based on the questionnaire data with PHHPS pain ranking and the follow-up visits.

Thoracoscopic splanchnicectomy, even with its beneficial effects on chronic pain relief, can not be considered as the best option in the analgesic therapy. As every single surgery it is related with certain complication intra- and postoperatively. At times, excessive bleeding may occur and thoracotomy may be required. Frequently, patients report intercostal pain caused by the traumatization of intercostal nerve by a stiff trocar. Also, lung parenchyma may be damaged and consequently pulmonary infiltration, pneumothorax and early pyothorax may occur [5, 8]. However, intraoperative or postoperative complications were not noted in the study patients. It may be related with the relevant expertise and experience of senior surgeons involved in the study and the non-invasive operation type.

The time of sustained pain relief after the thoracoscopic splanchnicectomy is another relevant issue. The subject reports provide contradictory data. In a study with chronic pancreatitis patients undergoing bilateral splanchnicectomy, pain returned in 50% patients 12 to 60 months after the surgery [16]. The sustained pain relief was also demonstrated in 11 out of 13 chronic pancreatitis patients 7 years after the surgery [17]. It seems that the main reason for unsatisfactory effects of splanchnicectomy may be the incomplete excision of the celiac nerve and its communicating branches, which is related with anatomical variation [8].

In the specific population of our patients this problem may be less relevant. The majority of our patients died in the course of advanced stage cancer up to six months after surgery, however the effects of pain relief were exceptionally successful in the entire group.

## Conclusions

The thoracoscopic splanchnicectomy is a well suited, although relatively unknown, method of the therapy of chronic pain related with advanced

cancer. It may be recommended as an option in the current palliative analgesic therapy.

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