Chapter 3

Thoracoscopic Splanchnicectomy

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Abstract

A serious problem for patients with unresectable pancreatic cancer and chronic pancreatitis is pain. For many of these patients medical therapy is unable to assure a good control of it. Celiac plexus nerve block and surgical denervation of the pancreas have proven their superiority over medical therapy. Thoracoscopic splanchnicectomy is a palliative procedure that consists in identification and division of all the roots of the splanchnic nerves from T5 to T10. It can be performed either on a single part or bilaterally.

Introduction

For pancreatic cancer (PC) patients, a serious problem is persistent pain that often contributes to anorexia and a poor quality of life [1]. Another disease with persistent pain that significantly affects the quality of life is chronic pancreatitis (CP). The first line of management is considered medical therapy followed by other methods [2]. In case of CP poor pain control leads to poor quality of life that is affecting the ability to pursue professional development, leading to social disability [3]. Moreover, in case of PC, some studies suggested that continuous pain might shorten the survival of such patients [4-6].

One of the major objectives that clinicians should pursue in the treatment of unresectable PC patients should be controlling the pain. In cases of CP some patients continue to have disabling pain despite the oral analgesics and/or drainage procedures (endoscopic or surgery). Using an-
algesic drugs in many cases implies problems of selection, timing and dose adjustment in correlation with intensity of pain. Most commonly used drugs include non-steroidal anti-inflammatory drugs (NSAIDS), Carbamazepine, Paracetamol, Tramadol and other opioids. Opioid analgesics are often accompanied by different side effects and incomplete pain relief [7].

Controlling the pain in case of unresectable PC and CP has proven to be challenging, invasive methods like celiac plexus nerve block and surgical denervation of the pancreas have proven their superiority over medical therapy [2,6,8-11]. In our days celiac plexus nerve block is made percutaneous and the effectiveness and adverse events was shown in multiple studies [2,6,8-11].

Thoracoscopic splanchnicectomy (TS) is a palliative procedure that consists in identification and division of all the roots of the splanchnic nerves from T5 to T10. Thoracoscopy provides a clear visualization of the splanchnic nerve branches. Keeping blood loss to a minimum and avoiding thoracotomy it carries a lower morbidity and mortality comparing to all other methods [12,13]. Usually is made on the left side but it can be performed bilaterally from the beginning or in the case of pain recurrence.

First that performed a splanchnicectomy by open surgery was Wittmoser [14] in 1969, while the first that had performed thoracoscopycaly was Worsey [15] in 1993 for a patients with pancreatic cancer. The first description of bilateral splanchnicectomy by open surgery for pain secondary to pancreatic cancer was described by Sadar [16] et al in 1974 and Cuschieri [17] et al. have reported for the first time in 1994 a bilateral thoracoscopic splanchnicectomy (BTS).

Anatomy

Thoracic splanchnic nerves conduct pain sensation from the abdominal organs around the celiac ganglion. Neurolytic treatment is addressed to the celiac plexus, instead a neurectomy is performed on the splanchnic nerves, either unilaterally or bilaterally. The celiac plexus consists of visceral afferent sympathetic and parasympathetic efferent fibers, located in the peri-aortic fat pads around diaphragmatic hiatus and celiac artery. Via sympathetic fibers pain is transmitted to the central nervous system. Classically there are three splanchnic nerves described: the greater, lesser, and least. Greater splanchnic nerves are most commonly form from branches at levels T5-T9, while the lesser splanchnics are formed from ganglia associated with T8-T12 and branches from T10-L1 form the least splanchnic nerves.

Thoracoscopic Splanchnicectomy for Chronic Pancreatitis

The most common symptom with a highly unfavorable impact on the quality of life in CP is abdominal pain, affecting 75–90% of patients [12]. As we know high pres-
pressure in pancreatic ducts is responsible for pain. In CP it increases to 80 mmHg while normal pancreatic duct pressure is 7–15 mmHg. Endoscopic retrograde pancreatography and stenting or pancreatique-jejunosotomy by open or laparoscopic approach is the treatment in case of pancreatic duct obstruction. Despite these treatments some patients continues to accuse pain.

In case of CP there is no causative treatment, exception of autoimmune and obstructive forms of the disease. Strict dietary rules, abstinence from alcohol and smoking are elementary in the treatment of chronic pancreatitis. Along with these, symptomatic management implies pain control, pancreatic enzyme supplements, compensation of blood sugar level disorders, and prevention of malnutrition. Celiac plexus blocks with alcohol made radiological fluoroscopy guided, CT-guided or endoscopic ultrasonography guided could achieve pain relief, but it is temporary and results are inconsistent [2,18]. In contrast to the neurolysis of the celiac plexus it seems that complete transection of the splanchnic nerves within the thoracic cavity offers long-lasting or even permanent pain relief in chronic pancreatitis. TS is a minimal invasive technique of denervation of the pancreas.

Surgical denervation of the pancreas by ablation of the splanchnic nerves or its branches is considered best option for patients with chronic pain caused by chronic pancreatitis. This can be done by open surgery, requir-
months; this review recommends early intervention (TS), due to the fact that patients treated with opioids had poor outcome.

A conversion rate of 1.3% is recorded in a systemic review [25] of 202 procedures in 16 reports. Another study made by Galketiya et al [19] reported zero conversion to open surgery rate but his limitation is obviously, with only seven patients studied. A study made by Howard et al [26] on 55 patients lead to conclusion that BTS appears to work best in patients who have had no prior operative or endoscopic interventions.

**Thoracoscopic Splanchnicectomy for Unresectable Pancreatic Cancer**

Adenocarcinoma of the pancreas is the fifth leading cause of cancer death in the world [27] and the fourth in the U.S.A [28]. Majority of the patients present with locally advanced or metastatic disease that made curative resection impossible. For these patients along with palliative surgical or endoscopic procedures for obstruction of the common bile duct and/or duodenum, pain treatment is challenging. Pain appears in the last stages of the disease and is the result of celiac plexus infiltration by the tumor. Almost 90% of the patients with advanced PC present pain [27], making the palliation of pain a central preoccupation for many researchers.

To ensure a good quality of life, the present recommendation for pain management propose a treatment plan that is starting with non-steroidal anti-inflammatory drugs, followed by escalating doses of opioids [29]. Despite the current recommendation does not mention a maximum dose for opioid medication, adverse effects can cause serious problems in clinical practice. Like we have mentioned before, some studies showed that pain may be associated with decreased survival in these patients [4-6]. Because of this, two palliative interventions, celiac neurectomy and splanchnic neurectomy, have received a full attention. Following we will talk about TS.

To address the patient for TS, we have to ensure that medical treatment have failed to ensure a pain control. This is more a subjective opinion but some authors[20] consider that if patient’s pain can be controlled by less than three daily doses of narcotics, and they continuing to have a productive life, surgery should be avoid or delayed. TS should be considered if the patient rate his/her pain as >3/10 on a visual analog score and if he/she are not able to accomplish activities of daily living [20]. Like in CP there is no general consensus on whether TS should be performed on the left side only or bilaterally from the beginning. Despite transient orthostatic hypotension or diarrhea are mentioned to be side-effects of BTS [30], many authors recommend BTS to remove the need for a second procedure if pain recurs. An argument for LTS is the short life expectancy of these patients, so most of them die shortly after the procedure, before they need a second
procedure.

Performing a thoracoscopy assume that we have questioned the patients regarding his/her pulmonary diseases or previous thoracic interventions.

Data from literature indicate that results of TS for palliation of the pain in unresectable pancreatic cancer are encouraging. A study [20] whose results were presented at the 2010 Asian Pacific Hepato-Pancreato-Biliary meeting, with a mean survival of 229 days, average pain scores dropped from 8.3 to 2.0 in cases of 36 patients with BTS. Also in a study by Lica et al [31] reported good outcomes on another 15 patients using LTS. Another study [32] on 20 patients have reported significant improvement in visual analog scores for at least 3 months post-operatively. A recent study [20] on 29 patients found a significant decrease in pain scores post-operatively (4.1 to 1.1; P value =0.004).

Surgical Technique in Unilateral Thoracoscopic Splanchnicectomy

The left-sided TS is mainly applied in the unilateral procedure, therefore we will describe this procedure in this chapter, although the procedure is the same on the right side (Figure 1), only that the patient is on the left lateral decubitus position.

The procedure is performed with the patient in the right lateral decubitus position with slight tilt anterior, exposing the left thorax. Double-lumen endotracheal intubation and single-lung ventilation is used for achieve general anesthesia. An intrathoracic pressure level of 8-10mmHg CO₂ insufflation is used to allow a better exposure and a more distal division of the greater and lesser splanchnic nerve. We recommend 3 trocar ports for this procedure. Placement of the trocars should be: optic trocar (10 mm) on the VIIth intercostal space on midaxillary line, two working trocars of 5 mm: one on the Vth intercostal space on anterior or midaxillary line and one through IXth intercostal space on posterior axillary line. Our recommendation is for use of 30 degree-angle videoscope, hook cautery, scissor and an atraumatic grasper. The as-
sistant is on the right side of the patient while the surgeon is in front of him. Usually identification of the splanchnic nerves through the transparency of the parietal pleura is easy. After identification of splanchnic nerves a pleurotomy from fifth intercostal space to the diaphragmatic recess is performed. The nerves are isolated using blunt dissection and sectioned using electrosurgical scissors. A pleural drainage should be placed at the end of the operation.

Effectiveness of unilateral TS on improving pain relief and the quality of life are demonstrated in some studies, [32-38] although the necessity of contralateral TS still remains controversial and undetermined. Some authors recommend using the corresponding part of abdominal pain to be used for unilateral TS.

**Surgical Technique in Bilateral Thoracoscopic Splanchnicectomy**

Some authors consider that pain control is better controlled with a bilateral neurectomy [20]. This procedure was first decribe by Cuschieri et al [17] using a posterior approach (Figure 2). The patient is placed in the prone position, and on each side two trocars of 5 mm are placed. If there is no 5 mm camera, a 10 mm trocar for the camera will be placed. We recommend to start the procedure on the left site, due to the fact that is well know that left pleura is often thicker with more retro pleural fat, making harder to identify the nerves.

On the other part, surgeons familiarized with this type of procedure should identify easily the nerve. While the anesthetist suspends respirations first trocar is placed at the inferior apex of the scapula. A camera of 10 mmHg pressure should be enough. We recommend the use of a 30-degree angled scope. After the first trocar is place and the pressure is 10 mmHg, respirations can be resumed. The second trocar is place under visual control in two intercostal spaces inferior to the first and about 2 cm medi-
ally. In case of elevation of the hemi-diaphragm it can be placed two intercostal spaces superior to the first. Rarely, if the situation requires, a third trocar can be placed. To identify the sympathetic trunk surgeon will look to the posterior thorax. Above the arch of the aorta the splanchnic nerves are identifies. After splanchnic nerves are identified a pleurotomy is made on each side of the nerve with a right angle cautery. Two to five nerves are usually found on each side. The nerves should be sectioned between the intercostal vessels, near to the vertebra, to avoid the risk of bleeding. A pleural drainage is placed at the end of this part, and the procedure continues on the left side with the same indications.

Conclusions

The pain is the most dominant symptom of CP in most of cases, and once controlled, life qualities change in a better way. The psychological aspects of the TS are very important, because it permit the rapid recovery and prompt return to everyday life.

Regarding patients with unresectable PC there are no reasons way they should suffer from abdominal pain without an attempt to cut it off. Like we have showed TS is an easy and convenient method to every surgeon to perform it. Using high-dose of narcotics can lead to multiple side effects, making TS a preferred method.

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