Scholars Journal of Medical Case Reports
Abbreviated Key Title: Sch J Med Case Rep
ISSN 2347-9507 (Print) | ISSN 2347-6559 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Anesthesiology and Pain Medicine

CT-Guided Radiofrequency Ablation of the Thoracic Splanchnic Nerve for Intractable Abdominal Pain and Back Pain Due To Metastatic Esophageal Cancer Metastases

Hotae Ji[1], Minkyung Lee[1], Jaewang Choi[1], Goeun Kim[1], Sangsoo Kang[1*]

[1]Department of Anesthesiology and Pain Medicine, Kangdong Sacred Heart Hospital, 150 Seongan-ro, Gangdong-gu, Seoul 05355

DOI: 10.36347/sjmcr.2022.v10i07.016 | **Received:** 09.06.2022 | **Accepted:** 11.07.2022 | **Published:** 19.07.2022

***Corresponding author:** Sangsoo Kang (MD, PhD, South Korea)
Department of Anesthesiology and Pain Medicine, Kangdong Sacred Heart Hospital, 150 Seongan-ro, Gangdong-gu, Seoul 05355

Abstract **Case Report**

We describe a case of a 51-year-old man who experienced intractable abdominal pain and back pain caused by esophageal cancer metastasis treated with a thoracic splanchnic nerve block and CT-guided radiofrequency ablation (RFA) in a hybrid operating room. This report describes the treatment course and considerable improvements.

Keywords: Esophageal cancer, intractable pain, Metastases, Radiofrequency ablation, Thoracic splanchnic nerve.

INTRODUCTION

There has been extensive use and research on minimally invasive procedures, including thoracic splanchnic nerve block and celiac ganglion block, to treat uncontrolled cancer pain (Loukas *et al.*, 2010). In case the diagnostic block can effectively reduce pain, neurolysis can be planned. Neurolysis methods include chemical ablation using 10 ml absolute alcohol or 6–10% phenol and radiofrequency ablation (Wong *et al.*, 2004).

We report a case of thoracic splanchnic nerve block and CT-guided radiofrequency ablation (RFA) in a hybrid operation room for a patient complaining of intractable abdominal pain caused by multiple metastases of esophageal cancer to the liver and abdominal lymph nodes.

CASE REPORT

A 51-year-old male patient with complaints of intractable abdominal pain caused by multiple metastases of esophageal cancer to the liver and abdominal lymph nodes was referred to our pain management department during inpatient treatment at the internal medicine section of the oncology department. The patient had been diagnosed with esophageal cancer 1 year ago; moreover, he had undergone an Ivor–Lewis operation and was undergoing palliative concurrent chemo-radiation therapy for recurrent cancer after chemotherapy. He complained of pain in the anterior abdomen with stiffness in the T12 region as well as back discomfort at night and early in the morning. Administration of an opioid analgesic for 1 hour decreased the visual analog scale (VAS) score from 9/10 to 3/10 (0: No pain, 10: Excruciating pain); however, it was a short-lasting effect. An abdominal computed tomography (CT) revealed aggravation of the lymph node invasion in the para-aortic areas as well as perivascular low attenuation in the celiac trunk due to metastasis of esophageal cancer. Accordingly, given the difficulty of controlling the cancer-induced pain using only opioid analgesics, the internal medicine section of the oncology department requested procedural treatment.

First, we planned to perform a diagnostic thoracic splanchnic block with 0.375% ropivacaine twice. The patient provided informed consent for undergoing the procedure twice after receiving explanations regarding the potential complications, expected outcomes, and our subsequent plan to perform RFA. After the diagnostic block, the patient showed immediate pain relief, with the VAS score decreasing from 9/10 to 2/10 for approximately 1 day.

However, the patient still suffered from severe recurring pain 3 hours after the procedure. We confirmed that the diagnostic block procedures were successful and ruled out a psychogenic effect. Subsequently, we decided to perform RFA of both thoracic splanchnic nerves at the T11 and T12 vertebral levels.

The patient was positioned in the prone position on the operation table of a hybrid operation room, with a pillow placed under the upper abdomen to reduce thoracic-lumbar lordosis. Electrocardiogram, pulse oximetry, and non- invasive blood pressure were monitored throughout the procedure. Additionally, a plasma solution was used for peri- procedural intravenous hydration. Prophylactic antibiotics were administered before the procedure; moreover, intravenous pethidine was prepared for patient pain control. The patient did not receive intraoperative sedation. We sterilized the area around the T11–T12 vertebral body using 10% povidone-iodine and 75% alcohol. To identify the T11 vertebral body, we used a fluoroscope, which was rotated obliquely approximately 15 degrees toward the left side. After anesthetizing the needle entry site and expected subcutaneous needle trajectory using 1% mepivacaine, four disposables 22-gauge, 100 mm, straight-tipped radiofrequency cannulas with a 10 mm active tip were advanced using the tunnel vision technique towards the lateral vertebral margin in oblique projection. The needle pathway was priory confirmed through CT images obtained to determine cancer progression. After the cannulas touched the lateral margin of the vertebral column, they were advanced to the junction between the anterior third and middle third of the T11 and T12 vertebral bodies bilaterally with the lateral projection, which hugs the lateral edge of the T11 and T12 vertebral bodies bilaterally (Figure 1). We injected 0.5 ml of contrast agent at each cannula under real-time fluoroscopy to determine the compartment flow and rule out complications such as intravascular positioning of the intrapleural cannulas (Figure 1). Additionally, the final needle tip position of the cannulas and co-occurrence of pneumothorax was checked with the chest CT image (Figure 2).

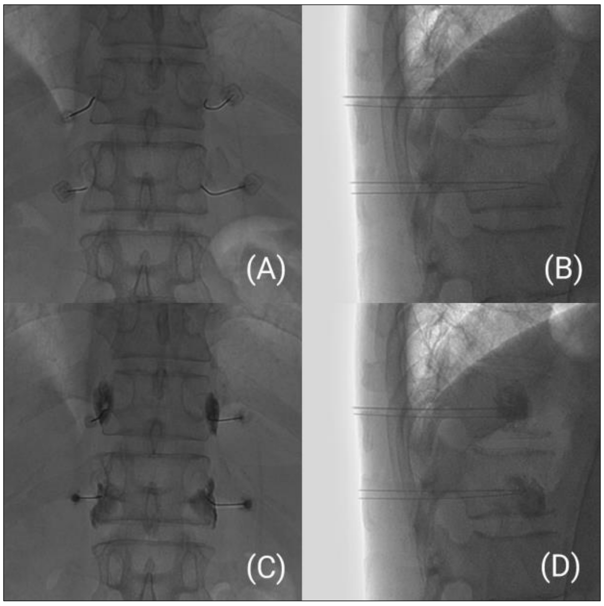

Figure 1: The tips of the radiofrequency cannulas were located at the junction of the anterior and middle thirds of the T11 and T12 vertebral bodies bilaterally. Anteroposterior and lateral fluoroscopic images before (A and B, respectively) and after contrast injection (C and D, respectively)

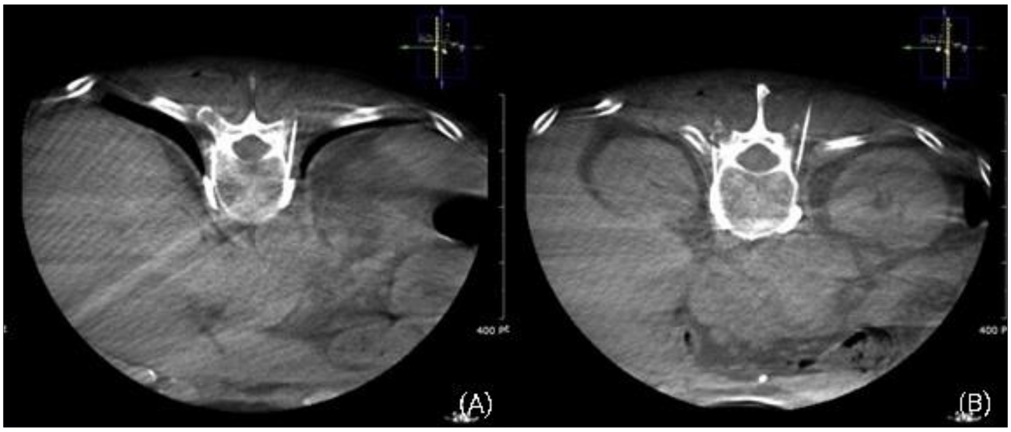

Figure 2: Real-time chest CT image. (A) T11 level and (B) T12 level axial views

Next, we performed nerve stimulations. At 50 Hz, sensory stimuli were administered up to 3.0V until the patient complained discomfort in the back and anterior abdomen at the T11-12 dermatome level, where the pain and discomfort occurred. At 2 Hz, the motor stimuli were increased gradually to 3.0 V, followed by confirmation of intercostal muscle contraction (Table 1). Before RFA lesioning, we injected 5 ml of 0.375% ropivacaine at each level. Local anesthetic injection could reduce pain during RFA lesioning. RFA lesioning procedures at each level were repeated twice or thrice until the RFA-induced pain dissipated. Thermal RFA was carried out at 80°C for 90 seconds × 2 cycles with needle rotation to maximize lesion size. After the procedure was completed, the patient reported pain relief, with the VAS score decreasing from 8/10 to 2/10. The patient was discharged after we confirmed there were no complications. Sustained pain relief was confirmed at the 1-week and 3-month follow-up visits.

Table 1: Motor and sensory nerve stimulation at each level

Stimulation	**Levels**			
	T11 Left	**T11 Right**	**T12 Left**	**T12 Right**
Sensory (50 Hz): the voltage at which the patient reported discomfort	1.7 V	0.7 V	2.9 V	0.9 V
Motor (2 Hz): the voltage at which the inter-costal muscle showed a twitching reaction	Above 3.0V	Above 3.0V	Above 3.0V	Above 3.0V

DISCUSSION

Patients with abdominal malignancy experienced intractable problem that often degrade quality of life and survival. (de Oliveira *et al.*, 2004; Wong *et al.*, 2004) While it is very crucial to control the pain appropriately with opioid analgesics for those patients, it is usually associated several side effects like narcotics addiction and may not be effective alone. (Markman *et al.*, 2007).

Neurolysis through chemical ablation or RFA can be performed for additional pain control while reducing such side effects (Wong *et al.*, 2004).

Two subtypes of nociceptive pain are somatic and visceral and these are classified depending on organ involvement and character of pain aspect. Many patients with chronic cancer pain suffer from overlap of various types of pain. (Muller-Schwefe *et al.*, 2014) The splanchnic nerves and celiac plexus associated visceral fibers act as comprehensive neurotransmission pathway of the cancer origin abdominal pain. (De Cicco *et al.*, 1997; Loukas *et al.*, 2010) Splanchnic nerves originate between the 5th and 12th thoracic vertebrae on both sides, pass through the sympathetic ganglia, enter the abdominal cavity through the diaphragm, and form a celiac plexus. The celiac plexus is responsible for innervation of most abdominal organs, including the stomach, liver, biliary tract, pancreas, spleen, kidney, adrenal gland, small intestine and ascending and transverse colon. Before comprising celiac plexus, splanchnic nerves are derived from thoracic vertebrae separately. The greater splanchnic nerve derives from T5 through T9, the lesser splanchnic nerve from T10 through T11 and the least splanchnic nerve from T12. (Loukas et al., 2010) These three thoracic splanchnic nerves exist within the compartment formed by the inner vertebral body, the outer pleura, the anterior posterior mediastinum, and the lower diaphragm (Boas, 1978).

Before determination of intervention method, we checked the effectiveness of each method and the risk of side effects. Firstly, about target selection, there are many studies and results showing good effects of the celiac plexus block method. (Suleyman Ozyalcin *et al.*, 2004; Wong *et al.*, 2004) However, there are a small number of reports that suggest celiac plexus block can cause a variety of side effects like diarrhea, severe hypotension due to cephalic spread of injection, monoplegia and anal and bladder sphincter dysfunction, pneumothorax, arterial injury (eg, dissection), local hematoma, pleuritis, transient hematuria, pericarditis, intervertebral disk injury, and retroperitoneal abscess. (Eisenberg *et al.*, 1995; Moore, 1999, 2004; Wang *et al.*, 2006)

The anatomical location of the splanchnic nerve has less variation compared to the celiac plexus, and the existing space is clearer and easier to reach. (Loukas *et al.*, 2010) In addition, there has been a recent report that the effect of targeting the splanchnic nerve is better than that of the celiac plexus. (Suleyman Ozyalcin *et al.*, 2004) Thus, the splanchnic nerve can be determined as a target for nerve block and neurolysis. However, pneumothorax and diarrhea may occur during splanchnic nerve block, and severe cardiac arrhythmias induced by phenol in splanchnic nerve block and diaphragmatic paralysis may occur. Neurolysis with chemical ablation may be preferred, but this may also have serious side effects due to the unexpected spread of alcohol or phenol through the route of injection. (Lalanne *et al.*, 1994; Suleyman Ozyalcin *et al.*, 2004) When performing this procedure, physicians aim to prevent side effects. The ventral border of the thoracic vertebra is adjacent to the pleura. Moreover, the descending aorta and inferior vena cava are adjacent to the thoracic vertebral body. Thoracic splanchnic nerve neurolysis with RFA has a risk of these structures being injured; however, the incidence rate of injury is low (Wong *et al.*, 2004). In case of a pleural or vascular puncture, pneumothorax or major bleeding can occur.

Conclusion

In conclusion, pain control is one of the most important components in the management of cancer patient and application of CT-guided bilateral splanchnic nerve RFA may be considered for pain modality with fewer complications in patients with metastatic esophageal cancer.

Acknowledgements

The authors declare that they have no funding and no financial support.

References

- BOAS, R. A. (1978). Sympathetic blocks in clinical practice. International Anesthesiology Clinics, 16(4), 149-182. https://doi.org/10.1097/00004311-197801640-00008
- De Cicco, M., Matovic, M., Balestreri, L., Fracasso, A., Morassut, S., & Testa, V. (1997). Single-needle celiac plexus block: is needle tip position critical in patients with no regional anatomic distortions?. *The Journal of the American Society of Anesthesiologists*, *87*(6), 1301-1308. https://doi.org/10.1097/00000542-199712000-00007
- De Oliveira, R., dos Reis, M. P., & Prado, W. A. (2004). The effects of early or late neurolytic sympathetic plexus block on the management of abdominal or pelvic cancer pain. *Pain*, *110*(1-2), 400-408. https://doi.org/10.1016/j.pain.2004.04.023
- Eisenberg, E., Carr, D. B., & Chalmers, T. C. (1995). Neurolytic celiac plexus block for treatment of cancer pain: a meta-analysis. *Anesthesia & Analgesia*, *80*(2), 290-295. https://doi.org/10.1097/00000539-199502000-00015
- Lalanne, B., Baubion, O., Sezeur, A., Tricot, C., & Gaudy, J. H. (1994, January). Circulatory arrest after splanchnic neurolysis with phenol in unresectable cancer of the pancreas. In *Annales de Chirurgie* (Vol. 48, No. 11, pp. 1025-1028). (Arrêt circulatoire après neurolyse splanchnique au phénol pour cancer du pancréas non reséquable.)
- Loukas, M., Klaassen, Z., Merbs, W., Tubbs, R. S., Gielecki, J., & Zurada, A. (2010). A review of the thoracic splanchnic nerves and celiac ganglia. *Clinical Anatomy*, *23*(5), 512-522. https://doi.org/10.1002/ca.20964
- Markman, J. D., & Philip, A. (2007). Interventional approaches to pain management. *Anesthesiology clinics*, *25*(4), 883-898. https://doi.org/10.1016/j.anclin.2007.07.012
- Moore, D. C. (2004). The dreaded complications from neurolytic celiac plexus blocks are preventable!. *Regional anesthesia and pain medicine*, *29*(4), 377-378. https://doi.org/10.1016/j.rapm.2004.02.001
- Moore, D. C., Ischia, S., & Polati, E. (1999). Computed tompgraphy eliminates paraplegia and/or death from neurolytic celian plexua block/Reply. *Regional anesthesia and pain medicine*, *24*(5), 483-486. https://doi.org/10.1016/s1098-7339(99)90027-5
- Müller-Schwefe, G., Ahlbeck, K., Aldington, D., Alon, E., Coaccioli, S., Coluzzi, F., ... & Sichere, P. (2014). Pain in the cancer patient: different pain characteristics CHANGE pharmacological treatment requirements. *Current Medical Research and Opinion*, *30*(9), 1895-1908. https://doi.org/10.1185/03007995.2014.925439
- Özyalçın, N. S., Talu, G. K., Çamlıca, H., & Erdine, S. (2004). Efficacy of coeliac plexus and splanchnic nerve blockades in body and tail located pancreatic cancer pain. *European Journal of Pain*, *8*(6), 539-545. https://doi.org/10.1016/j.ejpain.2004.01.001
- Wang, P. J., Shang, M. Y., Qian, Z., Shao, C. W., Wang, J. H., & Zhao, X. H. (2006). CT-guided percutaneous neurolytic celiac plexus block technique. *Abdominal imaging*, *31*(6), 710-718. https://doi.org/10.1007/s00261-006-9153-5
- Wong, G. Y., Schroeder, D. R., Carns, P. E., Wilson, J. L., Martin, D. P., Kinney, M. O., ... & Warner, D. O. (2004). Effect of neurolytic celiac plexus block on pain relief, quality of life, and survival in patients with unresectable pancreatic cancer: a randomized controlled trial. *Jama*, *291*(9), 1092-1099. https://doi.org/10.1001/jama.291.9.1092