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Dorsal Root Ganglion Stimulation for Treatment of Chronic Upper Abdominal Pain: A Case Report

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Background: The use of dorsal root ganglion stimulation (DRGS) has been widely reported in the treatment of inguinal and groin pain, post-herniorrhaphy pain. The use of the DRGS has more recently been proposed for upper abdominal symptoms. In this case report, we detail the potential use of dorsal root ganglion stimulation for the treatment of postoperative right upper quadrant abdominal pain.

Case Report: A 55 year-old female with history of pancreatic cancer with multiple abdominal surgeries including Whipple procedure. The patient presented to an outpatient interventional pain clinic with chronic upper abdominal pain symptoms. Recent gastrointestinal and spinal work-up was unremarkable. Having exhausted all conservative measures the patient was offered DRGS trial. The trial leads were placed at the right T7 and T8 dorsal root ganglion. The procedure was performed with conscious sedation and was well-tolerated.

Conclusions: Dorsal root ganglion stimulation (DRGS) presents a unique method of capturing upper abdominal visceral pain symptoms. The efficacy of DRGS offers another option in addition to conventional treatment, as well as dorsal column spinal cord stimulation (DC-SCS). Due in part to its use of selective dermatomal distribution of sensory perception one can reliably target a specific region of the abdomen where DC-SCS may not.

Key words: Dorsal root ganglion stimulation, neuromodulation, abdominal pain, chronic pain

BACKGROUND

The application of various neurostimulation techniques for abdominal pain has been elucidated in several publications. Dorsal column spinal cord stimulation (DC-SCS) has been used in the treatment of abdominal visceral-type pain (1-5). The use of conventional DC-SCS involves placement of spinal cord stimulator leads as cephalad at T4 through T8 to capture abdominal pain, as opposed to more traditionally treated low back or lower extremity pain symptoms. Although there has been reported successes in use of DC-SCS in treatment of abdominal pain symptoms, there is still a lack of evidence overall. The current evidence level of support is lacking. While therapeutic failures are fully expected, the question arises of whether a more specific, targeted approach might be more effective.

The use of dorsal root ganglion stimulation (DRGS) has been widely reported in the treatment of inguinal and groin pain, and post-herniorrhaphy pain (6-10). DRGS has been proposed for upper abdominal symptoms though evidence is still lacking (11). In this case report, we detail the potential use of DRGS for the treatment of chronic right upper quadrant and epigastric pain.

CASE

A 55-year-old woman with a history of pancreatic

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cancer with multiple abdominal surgeries, including the Whipple procedure, spanning from 1998-2012, presented to an outpatient interventional pain clinic with chronic upper abdominal pain symptoms. The pain was reported to average a 7/10 in severity, but 10/10 at its worst. She characterized her pain as a constant, dull, aching pain with intermittent bouts of sharp, stabbing pain in the right upper quadrant and epigastric regions. She denied any specific exacerbating or alleviating factors.

Recent gastrointestinal workup was unremarkable. Previous treatments included physical therapy, heat/ice, manual therapy, dietary changes, and a series of celiac plexus blocks and medications – all of which failed to provide any substantial short- or long-term relief. She had an intrathecal pain pump implanted for pain control, which was then later removed due to logistics of it being filled in a timely fashion. Even with the intrathecal pain pump, the patient still reportedly had breakthrough pain on a consistent basis. She has since been managing her pain with oral opioid medications. At the initial consultation, the patient was taking extended-release morphine sulfate 30 mg twice a day, and immediate-release morphine sulfate 15 mg 4 times a day (120 mg morphine equivalent), but stated that even with that amount of medication her pain symptoms were poorly controlled.

On physical examination, there was tenderness to the right upper quadrant and epigastric regions of the abdomen without rebound. Bowel sounds were normal. No thoracolumbar tenderness was appreciable. Range of motion of the thoracolumbar spine was within normal limits. Musculoskeletal and neurological examinations were both found to be equivocal.

Two-view thoracic spine radiographs taken on initial evaluation revealed normal alignment on anterior-posterior and lateral views. There was a slightly increased kyphosis noted in the mid-thoracic region. No evidence of compression fractures or spondylolisthesis. Disc spaces were maintained throughout the thoracolumbar spine. Surgical clips in the right upper quadrant were incidentally noted. No evidence of dynamic instability was present. Previously performed magnetic resonance imaging of the thoracic spine and computed tomography scan of the abdomen excluded other possible causes of her chronic abdominal pain. Prior to the trial, the patient was evaluated for, and obtained, psychological clearance.

In a recent retrospective study of clinical predictors for long-term success following DRGS, chronic opioid use was associated with poorer responder status, based on 50% pain relief threshold (12). This was taken into account when offering the therapy to the patient. However, given the lack of alternative therapeutic options, spinal cord stimulation therapy was discussed at length during her office visit. The patient was offered various alternative treatment options including repeated celiac plexus blocks, peripheral nerve blocks, and spinal cord stimulation.

The patient initially was reluctant toward the spinal cord stimulation trial due to her previous experience with the intrathecal pain pump. Medication management was taken over several months, and while medications reportedly reduced the pain symptoms, she continued to have debilitating pain. After a few months of ongoing pain management and multiple lengthy discussions, she was agreeable to a spinal cord stimulator trial. DC-SCS and DRGS were both discussed with the patient at length and she was agreeable to DRGS.

The procedure was performed with conscious sedation and was tolerated well without any reported complications. The trial leads were placed at the right T7 and T8 DRG. The patient reported concordant pain location with paresthesia mapping. During the trial, the settings were consistent: at T7, the stimulation parameters were frequency of 30 Hz, 200 pulse width, amplitude 0.200-.400 mA; and at T8, the stimulation parameters were frequency of 30 Hz, 200 pulse width, amplitude 0.600-1.200 mA. The only post-procedural sequela was a slight increase in procedural site pain which improved throughout the trial. After 5 days, the patient and her daughter were seen in the office to discuss trial results. At that time, the patient reported 80% overall improvement in her right upper quadrant and epigastric pain symptoms. Both the patient and her daughter noted that she did not have any severe episodes of abdominal pain symptoms during the trial, which prior to that would occur on a daily basis. Pain symptoms were reduced from a 10/10 to a 2/10 in overall severity. She denied any procedural sequelae following lead removal.

After completion and discontinuation of the DRGS trial, the patient reported complete return of the pain symptoms. At the time of the writing of this case report, the patient was scheduled for permanent implantation. While awaiting the permanent implantation, and authoring this case report, it was again inquired on the amount of relief she received with the DRGS trial. She

steadfastly reported relief of 80% overall improvement. She additionally reported that she would highly recommend this therapy to others with similar symptoms.

DISCUSSION

DRGS presents a unique method of capturing upper abdominal pain symptoms (13). Due, in part, to its use of selective dermatomal distribution of sensory perception, one can reliably target a specific region of the abdomen where DC-SCS may not. In this case report, T7 and T8 DRG were targeted to cover the abdominal upper quadrant pain symptoms. Although there are reports of use of conventional SCS for the treatment of abdominal pain, these sites may be difficult to target with SCS as relevant dorsal column fibers are relatively less accessible to epidural stimulation. The reason for this is likely a result of directly stimulating the somata of primary sensory neurons (13). Additionally, DRGS has been shown to enhance the DRG band-pass filtering properties at the T-junction (the meeting point of the peripheral axon, central axon, and the DRG stem axon) (14). This combination of unique mechanisms of action, compared to that of traditional DC-SCS, likely explain differences in DRGS and DC-SCS coverage and efficacy.

In this particular case report, DRGS was used to treat chronic abdominal pain stemming from resection of a pancreatic mass and the Whipple procedure. The indications of neuromodulation are expanding and similarly DRGS potentially may be able to treat other types of visceral pain symptoms (1-3,5). In the upper abdomen, future application of DRGS might be considered in the treatment of chronic conditions, such as pancreatitis, gastritis, hepatitis, and irritable bowel syndrome.

CONCLUSIONS

Despite growing use of DRGS therapy in the tho-

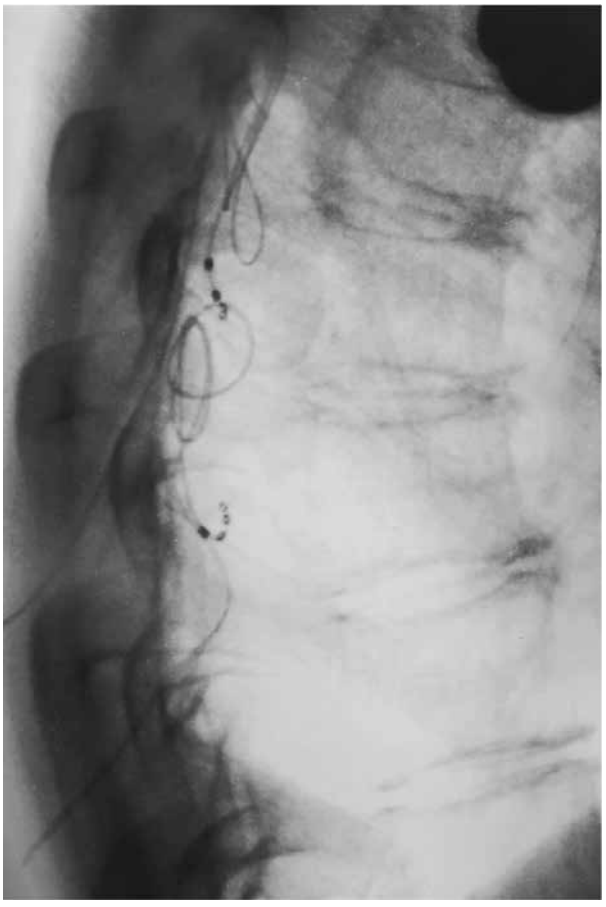

Fig. 1. Lateral view of DRG implantation at T7 and T8 levels.

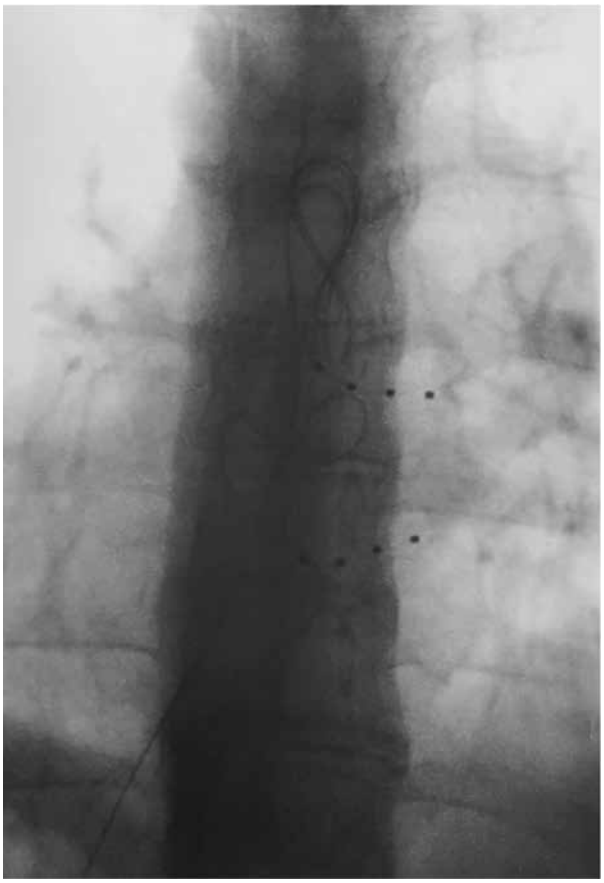

Fig. 2. Posterior-anterior view of view of DRG implantation at T7 and T8.

racic spine (15-17), the authors recognize that further research is needed for its use in treatment of upper abdominal pain. This case study confirms its efficacy in treatment of chronic upper abdominal pain, particularly where other conservative measures and interventional procedures have failed. Furthermore, it highlights future indications for the use of neuromodulation therapy in the treatment of various types of visceral pain.

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