CASE REPORTS

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Cryoablation: A Novel Approach to Neurolysis of the Ganglion Impar

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THE ganglion impar (also known as the *ganglion of Walther*) is a solitary retroperitoneal structure at the caudal end of the sympathetic chain. Blockade of this ganglion has been advocated as a means for managing intractable perineal pain. Chemical neurolysis has been the technique of choice for therapeutic neurolytic blockade of the ganglion impar because of a lack of viable alternative techniques.[1] The use of cryoablation for neurolysis of the ganglion impar has not been heretofore reported. Using a novel technique, a patient with perineal pain after rectal surgery for removal of tumor received successful long-lasting pain relief without adverse sequelae from cryoablation of this ganglion. This report demonstrates that cryoanalgesic lesioning of the ganglion impar is efficacious using the technique reported here.

Case Report

A 73-yr-old man with chronic anal and perineal pain was referred for consultation. Five years previously, he underwent surgical resection of a rectal carcinoma. The procedure consisted of an anterior-posterior resection and closure of his anal orifice. One year after this procedure, he began to experience constant burning pain with intermittent stabbing sensations in his anal and perineal area. The pain began insidiously and increased in intensity over the following year. He was awakened several times each night. Using a visual analog pain score, the intensity of the pain was reported as 9/10 at its best and 10/10 at its worst. Standing, walking, and sitting exacerbated the pain. Lying in the supine or in the lateral decubitus positions provided him with some relief.

Multiple tricyclic antidepressants, membrane-stabilizing agents, nonsteroidal anti-inflammatory agents, and opioids failed to control this pain. Similarly, hypnotherapy and perianal infiltration analgesia with local anesthetic did not provide pain relief.

Medical history included coronary artery disease, three-vessel coronary artery bypass, hypertension, peripheral vascular disease, and Parkinson's disease.

Physical examination revealed a 6′1″, 217-lb man. Motor and sensory examination was normal except for a left hand "pill-rolling" tremor and a slow shuffling gait. A small, well-healed scar was noted where his anal orifice had been. No tenderness or reproduction of his pain was elicited by palpation. There was no allodynia, hyperalgesia, or hypesthesia present.

Imaging studies were obtained for evaluation of his pain symptoms. Single-column barium enema through his colostomy revealed unobstructed flow, three small diverticuli, and no evidence of diverticulitis or fixed lesions. Abdominal and pelvic magnetic resonance imaging confirmed the diverticuli. No abdominal or pelvic masses were identified.

During his course of care at our Pain Management Center, we performed a diagnostic block of his ganglion impar with 8 ml of 0.25% bupivacaine using the traditional "bent needle" technique piercing the anococcygeal ligament.[2] This provided the patient with complete pain relief for 4 h. Chemical neurolysis with 8 ml of 6% phenol was then performed using the same technique. The patient received approximately 6 weeks of 70-80% pain relief. This neurolytic block was repeated twice with similar results.

In hope of avoiding repetitive chemical neurolysis and its attendant risks (to be discussed), cryoablation of the ganglion impar was performed in the following manner. The patient was brought to the fluoroscopy suite and placed in a prone position on a fluoroscopy table. Before beginning the procedure, a cryoprobe (2.0-mm tip) was inserted through the catheter of a 10-gauge, 5-inch intravenous catheter/needle unit so that the cryoprobe tip extended the same distance as the 10-gauge needle through the catheter. This point was marked along the shaft of the cryoprobe using a crystal violet marking pen. The patient's sacral and gluteal areas were then sterilely prepared with povidone iodine antiseptic solution, and this area was circumferentially draped with sterile towels. The fluoroscope was used to image a cross-table lateral view of the patient's pelvis including his sacrum and coccyx. The sacrococcygeal disc was identified. A local anesthetic skin wheal was raised overlying this structure. A 22-gauge, 7-inch spinal needle was passed through the lumen of the intravenous catheter/needle unit. With such an arrangement, 2 inches of the spinal needle will extend beyond the tip of the intravenous catheter/needle unit. This system was then passed percutaneously

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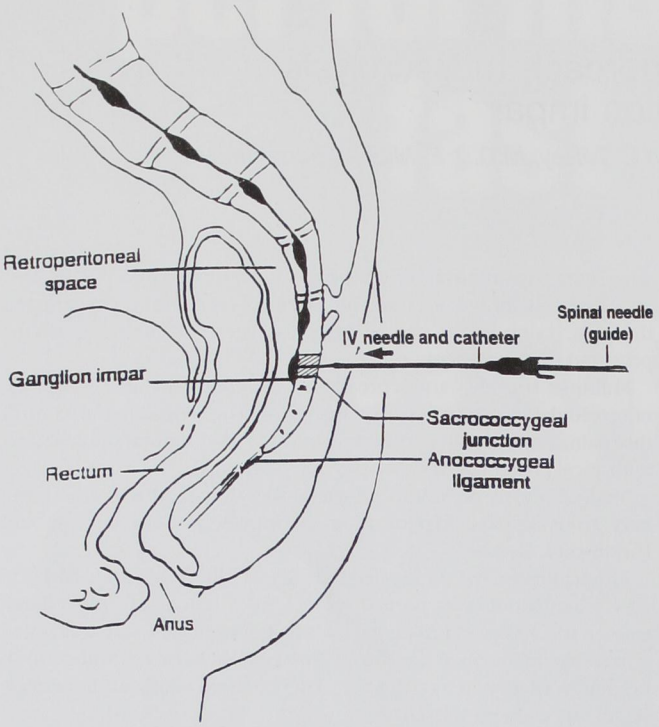

Fig. 1. A 22-gauge, 7-inch spinal needle (passed through a 10-gauge, 5-inch intravenous needle and angiocath) is percutaneously advanced to the anterior border of the sacrococcygeal disc.

through the skin wheal perpendicular to the sacrococcygeal disc. The spinal needle served as a guide over which the larger 10-gauge intravenous needle and catheter were subsequently passed. Using fluoroscopic guidance, the spinal needle was placed on the anterior surface of the sacrococcygeal disc, and the intravenous needle and catheter were advanced to this point (fig. 1). The spinal needle was then removed, and 1 ml of Omnipaque® (Nycomed, Inc., New York, NY) nonionic contrast dye was injected to confirm the retroperitoneal position of the 10-gauge intravenous catheter and needle. The intravenous needle was removed leaving the radiolucent catheter in place.

The cryoprobe was then inserted through the radiolucent catheter and advanced to the premeasured mark on its shaft. A fluoroscopic image confirmed the probe's location just anterior to the sacrococcygeal disc (fig. 2). Using the nerve stimulator affixed to the WestCo Neurostat® (San Diego, CA), no sensory response was achieved through a range of stimulation to a maximum of 0.7 V. Similarly, no motor response was achieved through a range of stimulation to a maximum of 2 V. This indicated that the cryoprobe tip was a safe distance from somatic and motor nerves in the perineum. Two freeze cycles of 3-min duration at −60°C were performed with an intervening 30-s defrost period.

The patient noted approximately 90% pain relief immediately after this procedure. Eighty percent pain relief was obtained for 6 weeks, during which time his opioid requirement decreased by 70%. He underwent this procedure again (after a gradual return of his pain to its previous intensity) with similar pain relief and opioid-sparing effects for 12 additional weeks. No complications were noted.

Discussion

The ganglion impar is the termination of the paired paravertebral sympathetic chains. It is a solitary retroperitoneal structure located on the anterior surface of the sacrococcygeal junction. Diagnostic neural blockade and subsequent chemical neurolysis of the ganglion impar have been advocated as a means of managing visceral perineal pain. Neuroablation of this structure can be frustrating for patient and practitioner as proper needle placement by the conventional "bent needle" technique is sometimes difficult. Moreover, the potential risks of chemical neurolysis include motor, sexual, bowel, or bladder dysfunction as a result of the inadvertent spread of the neurolytic agent to the respective neural structure(s). The development of neuritis and neuralgia is an attendant risk after any chemical neuroablative procedure.[3]

Cryoablation represents an alternative technique to the repetitive use of chemical neurolysis in patients who are candidates for ganglion impar neuroablation. In a cryoprobe, N_2O or CO_2 gas is used to cool the probe tip (to approximately −60°C). This temperature decrease causes the probe tip to extract heat from the surrounding tissue, forming an ice ball. Axonal degeneration and neural disruption occur. Cryoablation is most appropriate for painful conditions amenable to small

Fig. 2. Cryoprobe advanced through 10-gauge angiocath.

well-localized lesions.[4] The amount of tissue destruction depends on the size of the cryoprobe, freezing time, tissue permeability to water, and the presence of vascular structures.[4] The ice ball typically measures 3.5–5.5 mm in diameter.[5] Cryoablation has a lower incidence of neuritis and neuroma formation compared with chemical neurolysis.[5] After cryoablation, the perineurium and epineurium remain intact, assuring that neural regeneration occurs and that a neuroma is unlikely to form.[5]

We note that although the well-controlled lesions produced by cryoablation are desirable, they may also limit the success of this technique. The success rate of this method in the general population will depend on the anatomic variability of the location of the ganglion impar in relation to the sacrococcygeal disc. We have not been able to find an examination of this variance in the literature. To compensate for this expected variance, we decided to create a large freeze ball (5.5 mm). This necessitated the use of a 14-gauge cryoprobe and a 10-gauge intravenous needle and catheter. Obviously, these instruments could cause sharp and blunt trauma to pelvic structures, and we must caution those who attempt this technique to maintain constant control of the needle and probe during their insertion and throughout the neurolytic process.

We have adapted the "transsacrococcygeal ligament" approach to the ganglion impar (as advocated by Wemm and Saberski[6]) for cryoanalgesic lesioning. This modified approach is extremely quick and easy to perform. It is less technically demanding than the "bent needle" technique, and it allows for a "straight-line" placement of a stiff cryoprobe anterior to the sacrococcygeal ligament in the vicinity of the ganglion impar. The classic "bent needle" technique would be impossible to use for cryoanalgesic lesioning given the rigidity of the cryoprobe. On the other hand, puncture of the sacrococcygeal disc necessitates that the integrity of this structure is breached. The sacrococcygeal disc, made up mainly of glycoproteins during the early years of life, may later ossify.[7] Infection or bleeding are potential complications after the penetration of a disc, although no reports of such sequelae have appeared in the literature of ganglion impar block.

In conclusion, we report the use of cryoablation of the ganglion impar for the management of perineal pain. This is offered as an alternative to chemical neurolysis. The focality of tissue destruction is desirable. The potential for discitis and trauma as well as the reproducibility of this technique must be explored further.

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