Using an Epistim[®] catheter for a continuous epidural block for treating pain from herpes zoster or postherpetic zoster neuralgia

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A continuous epidural block is used widely for controlling pain from acute herpes zoster or postherpetic neuralgia (PHN). Positioning the epidural catheter in the epidural space accurately is one of the challenges. An Epistim[®] (Sewoon Medical, Korea) catheter was used to position the epidural catheter in the epidural space accurately. The medical records of patients who underwent a continuous epidural block with an Epistim[®] catheter for treating pain from acute herpes zoster or PHN were reviewed to evaluate the effectiveness of the continuous epidural block with the Epistim[®] catheter. The numeric rating scales (NRS) before and after the continuous epidural block with the Epistim[®] catheter were compared. The patients were divided into the acute herpes group and PHN group and NRS change in each group was observed. The NRS of all patients decreased in this study. Similar results were observed in the acute herpes group and PHN group each. When a continuous epidural block is performed, the Epistim[®] catheter can be very useful for positioning the epidural catheter at the target site more accurately. In addition, it can provide good results when treating pain from herpes zoster or PHN.

Keywords: Continuous epidural block; Epidural catheter, Epistim[®] catheter; Herpes zoster; Neuralgia, postherpetic

INTRODUCTION

Herpes zoster causes neuropathic pain that interferes with the activities of daily living and reduces the quality of life. Herpes zoster and postherpetic neuralgia (PHN), which are the long-term complication of herpes zoster, have a major impact on the patients' lives across all four health domains: physical, psychological, functional, and social. A clear correlation exists between the severity of pain and the interference in daily activities [1].

The treatment of herpes zoster and PHN is usually

achieved by medication, including antiviral therapy and analgesic treatment. In addition, physicians treat the pain associated with herpes zoster and PHN via interventions, such as a neural blockade or sympathetic blockade [2].

An epidural block is a simple and useful method for treating the pain associated with the herpes zoster. Because the herpes zoster is a neurodermatomal illness, an appropriate epidural block can provide an effective treatment for herpes zoster pain. Manabe et al. [3] reported that a continuous epidural block for patients with herpes zoster can shorten the duration of treatment and reduce

the incidence of PHN. Although it is unclear if the epidural block itself has an additive effect on the remedy of PHN, it is used most frequently for treating the PHN in clinical practice [4].

A continuous epidural block with an epidural catheter is a simple and widely used method practiced in pain medicine. On the other hand, it has potential problems, particularly related to the position of the epidural catheter [5]. An epidural catheter does not always follow the straight and predictable course in the epidural space and it can form a loop or coil during catheter insertion [6-9]. Malposition of the catheter can make the treatment less effective and require more doses of local anesthetics for treating pain. This would lead to an increase in the risk of local anesthetic toxicity. Reinsertion of the epidural catheter may be required.

An Epistim® (Sewoon Medical, Cheonan, Korea) catheter is an endhole-type catheter, in which a conductive guidewire can be used to deliver electrical stimulation via the catheter tip allowing the nerve root of a specific spinal segment to be stimulated electrically so that the corresponding dermatome will respond. The pain-provoking lesion can be located using an electrical stimulation technique in the epidural space. In addition, it favors easy manipulation to place the catheter into the pathogenic lesion. For this reason, it is possible to target the precise dermatomal level of pain using the Epistim® catheter.

The Epistim® catheter has been used for patients with acute herpes zoster pain or PHN in the authors' pain clinic center with good results. The medical records were reviewed and its effectiveness was evaluated.

MATERIALS AND METHODS

This retrospective observational study was approved by the Institutional Review Board of Daejeon St. Mary's Hospital, which permitted obtaining written informed consent (IRB no. DC15RISI0060). The medical records of the patients who received a continuous epidural block with an Epistim® catheter for treating pain associated with an acute herpes zoster or PHN in the authors' pain clinic center were reviewed. The procedures were done between September 2014 and May 2015. All of the patients were diagnosed with acute herpes zoster or PHN and complained of pain with

a pain intensity score more than 3 on an 11-step numeric rating scale (NRS) before the procedure. Preoperative blood tests before the block (complete blood count, prothrombin time/activated partial thromboplastin time, electrolytes, blood urea nitrogen/creatinine, aspartate aminotransferase/alanine aminotransferase) showed no abnormalities. If the patient had been taking anticoagulants, the block was performed 7 days after holding the anticoagulant.

Procedure

Informed consent was obtained from the patient after being given a detailed discussion of the procedures' related risks and benefits. The NRS before the procedure was recorded. The patient was placed in the prone position. The dermatomal level at which the patient mainly complained of pain was the target. Following sterile preparation and draping, skin puncture was done at 4 levels below the target level. Local infiltration of 2% lidocaine was performed at the puncture site. A Tuohy needle was used for skin puncture and inserted into the epidural space. A loss of resistance technique was used to find the epidural space. After the tip of the Tuohy needle was located in the epidural space, an Epistim® catheter was inserted via the Tuohy needle.

The guidewire was fixed to the catheter in that the end of the guidewire was approximately 2 mm below the catheter tip. The catheter was advanced to the cephalad direction with the guidewire. After the catheter tip was located near the target level by the length of the catheter inserted into the epidural space, an electrical stimulator was connected to the guidewire.

The stimulation frequency was set to 2 Hz. The amplitude of the electrical current was increased slowly from 0.1 mA and the response of the patient as to whether he or she felt stimulation in the dermatomal area, which is concordant with their pain, was checked. The electrical current was increased stepwise until the patient could endure the maximum stimulation. The guidewire was removed from the catheter after confirming the patient's response to electrical stimulation. Subsequently, an examination was made to confirm that the catheter was in the epidural space at the target level using 5 mL of contrast media and the catheter was fixed to the skin. A bolus of 0.2% ropivacaine 5 mL and hyaluronidase 1,500 IU was injected, and a patient-controlled analgesia (PCA) pump (AutoSelector®; Ace

Medical, Seoul, Korea) was then connected to the catheter and initiated. The PCA solution contained 0.2% ropivacaine (300 mL) and the basal infusion rate was set to 2 mL/h. The PCA pump was maintained for 1 week. The NRS was checked after removing the PCA pump with the catheter.

Data collection and analysis

The patients' gender, age, diagnosis including affected dermatome, NRS before and after the block, electric current that the patient felt the stimulation first (electric current at first sense), and maximum electric current that the patient could endure (electric current at maximum stimulation), were collected from the medical records.

The NRS before and after the continuous epidural block with the Epistim® catheter was compared. The patients were divided into acute herpes zoster and PHN groups and the NRS changes in each group were assessed.

R (Windows ver. 3.2.0, The R foundation for Statistical Computing, Vienna, Austria) was used for statistical analysis. A paired t test was used for to compare the NRS before and after the block. A Fisher's exact test and two sample t-test were used to compare the acute herpes zoster and PHN groups. Descriptive statistical analyses were conducted from the data and the results are expressed as the number of patients or mean±standard deviation. The p-value<0.05 was considered statistically significant.

Table 1. Demographic data (n=24)

Characteristic	Value
Gender (male/female)	6/18
Age (y)	64.5±14.9
Diagnosis (acute herpes zoster/PHN)	11/13
Affected dermatome	
C6	3
T2	3
T3	1
T4	1
T5	6
T6	1
T7	1
T8	1
T9	2
T10	2
T11	3

Values are number only or mean±standard deviation. PHN: postherpetic neuralgia.

RESULTS

Twenty four patients were enrolled in this study; there were more females than males. The mean age of the patients was 64.5±14.9 years old. Eleven patients were in the acute herpes zoster group and 13 patients were in the PHN group. The most involved level was T5. The mean electrical current at the first sense was 1.6±0.8 mA and the mean electrical current at the maximal stimulation was 4.0±1.3 mA (Table 1). The NRS of the patients decreased significantly after the block (Fig. 1). The NRS before the block and the degree of NRS change showed a positive correlation (Fig. 2).

There was no significant difference in the demographic data, electrical current at the first sense, and the NRS before and after the block were similar in the acute herpes zoster and PHN groups (Table 2). The NRS decreased significantly after the block in both groups (Fig. 3).

Fig. 1. Change in the numeric rating scale (NRS) after the block.

Fig. 2. Correlation between the numeric rating scale (NRS) before the block and the change in the NRS (reduction).

Table 2. Acute herpes zoster group and PHN group

Characteristic	Acute herpes zoster (n=11)	PHN	p-value
Gender (male/female)	3/8	3/10	1.000
Age (y)	58.1±17.7	70.0±9.6	0.065
Affected dermatome			0.888
C6	1	2	
T2	1	2	
T3	0	1	
T4	0	1	
T5	3	3	
T6	1	0	
T7	0	1	
T8	0	1	
T9	2	0	
T10	1	1	
T11	2	1	
Electrical current at first sense (mA) ^a	1.3±0.8	1.8±0.8	0.120
Electrical current at maximum stimulation (mA) ^a	3.2±1.7	4.5±0.9	0.093
NRS before block	5.9±1.6	4.9±1.6	0.152
NRS after block	2.3±1.0	1.8±0.8	0.194

Values are number only or mean±standard deviation. PHN: postherpetic neuralgia, NRS: numeric rating scale. ^aFrequency: 2 Hz.

DISCUSSION

Tsui et al. [10] used electrical stimulation to confirm the epidural catheter placement in 1998. Subsequently, several studies have examined the use of electrical stimulation to confirm the epidural catheter placement. The motor response (muscle twitching) was used to confirm the place of the catheter tip in previous studies [11–16]. The sensory response of the patients with the Epistim[®] catheter was used. They could feel the stimulation directly and report whether the tip of catheter had been placed at the exact level of which they mainly complained of pain. This made it possible to place the catheter tip more accurately for treating pain and perform a continuous epidural block more effectively.

The Epistim[®] catheter used with a guidewire has several advantages for inserting the catheter into the epidural space. The guidewire can prevent the catheter from kinking or coiling in the epidural space. In addition, it makes it possible to insert the catheter from a point more distant from the lesion (target level). The epidural catheter should be advanced only 3 to 5 cm into the epidural space because

Fig. 3. Change in the numeric rating scale (NRS) in the acute herpes zoster group and postherpetic neuralgia (PHN) group.

inserting a longer length of catheter in the epidural space increases the risk that it will form a knot, enter an epidural vein, puncture the spinal meninges, exit an intervertebral foramen, wrap around a nerve root, or wind up in some other disadvantageous location [17]. In the case of acute herpes zoster, an infection from vesicles also should be considered if the catheter is inserted from the skin near the lesion. An Epistim[®] catheter can be inserted from a longer distance from the lesions and advanced into the targeted epidural space without kinking or coiling because of its guidewire. In addition, it is also possible to advance the catheter, even if there is adhesion in the epidural space.

All patient treatments, either with acute herpes zoster pain or with PHN, reviewed in this study showed a decrease in NRS after the block and all of them were satisfied. The degree of NRS reduction showed a positive correlation with the NRS before the block. The treatment effect and the patient's satisfaction were greater for more severe pain.

This study had several limitations. First, it included a small number of patients and has the limitations of a retrospective study. A controlled study that compares with a continuous epidural block without an Epistim[®] catheter will be necessary to confirm the effectiveness of the Epistim[®] catheter. Second, the long term effect after the treatment was not confirmed in this study. The effectiveness of an epidural block for acute herpes zoster pain has already been proven, but there is a lack of evidence for PHN [18,19].

In conclusion, an Epistim[®] catheter can be very useful for locating an epidural catheter at the target site accurately when performing a continuous epidural block. The applica-

tion of an Epistim® catheter is expected to offer a more effective continuous epidural block for patients with other pain conditions in addition to those related to acute herpes zoster or PHN. Further studies designed with a randomized controlled trial, more patients, and a longer term follow up based on this study are recommended.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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