



Case Study

## Efficacy of scrambler therapy on breast cancer-related lymphedema

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**Abstract.** [Purpose] This study aimed to determine the effect of scrambler therapy on upper extremity pain in patient who had undergone breast cancer related lymphedema. [Participant and Methods] The patient was a 39-year-old woman who developed pain and lymphedema in the right upper extremity after mastectomy. Scrambler therapy was administered once a day every 45 minutes for 10 days to patient. [Results] After 10 sessions of scrambler therapy, pain was reduced 6 points. Bioimpedence and circumference was not increased after 10 treatment sessions. [Conclusion] Thus, scrambler therapy reduced pain without increased lymphedema.

**Key words:** Scrambler therapy, Lymphedema, Pain

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### INTRODUCTION

Lymphedema (LE) is an adverse condition mainly seen in breast cancer patients and causes pain, heaviness, chronic inflammation, and a thickening of the skin<sup>1)</sup>. Although a complex decongestive therapy can be a representative treatment both for LE and its associated pain<sup>2-4)</sup>, the therapy is time intensive, requires daily bandaging<sup>1)</sup>, has side effects such as skin flare<sup>5)</sup>, and can be ineffective when the patient shows poor compliance<sup>6)</sup>.

Recently, a scrambler therapy has been studied to treat cancer patients' pain<sup>7, 8)</sup>. It is designed to scramble other signals into pain signals to force the brain to recognize the pain signals as non-pain signals<sup>9)</sup>. Studies have reported its effects on chronic pain, cancer pain, and neuropathic pain<sup>10)</sup>. Because some existing studies have reported the scrambler therapy's therapeutic effects on patients with breast cancer-related lymphedema (BCRL)<sup>7)</sup>, it may show efficacy in treating pain for LE found in the upper extremities. However, there have been few studies focusing on the effects of a scrambler therapy on LE. In this case report, we applied a scrambler therapy to a patient with BCRL and investigated its effects and efficacy on LE.

### PARTICIPANT AND METHODS

The participant was a 39-year-old female patient who had undergone a right-side mastectomy on March 7, 2012, followed by radiology therapy and chemotherapy. Due to pain and lymphedema on her right upper extremity that began on August 11, 2012, she underwent both conservative physical and complex decongestive therapies until April 2016, but these therapies did not reduce her pain. Subsequently, a scrambler therapy was applied. The patient showed nothing unusual related to her health except for the pain and lymphedema in her right upper extremity. Before proceeding with the research, the purpose and method of the research was explained to the patient and consent was obtained. Study participant received explanations about the study procedures, voluntarily participated, and provided written informed consent. The experimental procedures were designed and conducted in accordance with the tenets of the Declaration of Helsinki.

The participant visited a physical therapy room on June 28, 2016, where we measured her pain and the circumferences

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of her upper right extremity and performed a bioimpedance analysis (BIA). The Visual Analog Scale (VAS) was used to measure the pain, which was recorded as VAS 8. A tape measure was used to measure the axillar, 10 cm above the elbow, the elbow, 10 cm below the elbow, the wrist, and the hand<sup>11</sup>, the measurements were 31, 27, 24, 21.5, 15.5, and 17.5 cm, respectively. An Inbody S10 (Biospace, Seoul, KOREA) was used to perform the BIA; the body water was 1,140 ml and the water percentage 0.392. Using a MC-5A Pain Scrambler Therapy (GEOMC, Seoul, Korea), we attached five channels with electrical stimuli to an upper area that was three finger joints away from the patient's painful area (toward the shoulder) and to each finger. The frequency of the stimuli was 43 to 52 Hz. The stimulus strength was 5 mA, which provided a natural electrical signal to human body. We raised the strength to the degree that the patient felt a stinging pain. The patient was treated for 45 minutes at a time for 10 days except for weekends and did not receive any other treatment during this period. After 10 sessions, we re-measured her pain, the circumferences, and performed another BIA.

## RESULTS

The patient's pain was reduced to VAS 2. The circumferences showed no changes at 31, 27, 24, 21.5, 15.5, and 17.5 cm. The post-treatment BIA showed that the body water was 1,130 ml and the water percentage 0.38, which showed a reduction of 10 ml and 0.007%, respectively.

## DISCUSSION

The purpose of this report was to investigate the effects of a scrambler therapy on the LE-related pain of a BCRL patient. The results showed that the pain was reduced without an increase in LE.

Although only a few researchers have determined the effects of a scrambler therapy on BCRL patients, this type of therapy is likely to be effective in reducing the pain of BCRL patients. Coyne et al. found that a scrambler therapy showed efficacy for patients, including those with BCRL<sup>7</sup>, and Park et al. reported that patients whose left pelvic bone had metastasis after breast cancer surgery showed a reduction in pain with this therapy<sup>8</sup>. While the existing studies did not focus on pain within the LE lesion, the changes in LE should be considered, because such changes can affect pain. Given that LE has not been assessed in the existing studies, this report may be significant in that it addresses pain reduction by estimating the changes in LE.

There are recent studies that address the effects of electrotherapy on LE<sup>12, 13</sup>. Belmonte et al. reported that electrotherapy applied to LE patients did not significantly reduce LE<sup>12</sup>, while Piller et al. identified the positive effects of the therapy on LE reduction<sup>13</sup>. Because electrotherapy did not increase LE as shown in prior studies, and the scrambler therapy did not increase in LE as shown in this report, the scrambler therapy may not increase LE in BCRL patients either and may contribute to effective pain control for BCRL patients.

This article is a case report of an individual treatment outcome of a BCRL patient. Because the participant of the study consisted of only one patient, a correlation between the scrambler therapy and LE was not clearly determined in this report. However, given that a positive result of pain reduction was observed without an increase in LE, this report may serve as a basis for performing a larger-scale research in the future.

### *Conflict of interest*

None.

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