

Case Study

# Low-level laser therapy for the treatment of superficial thrombophlebitis after chemotherapy in breast cancer patients: a case study

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**Abstract.** [Purpose] We report the case of a breast cancer patient with superficial thrombophlebitis treated with low-level laser therapy. [Case] The patient was a 66-year-old women who developed superficial thrombophlebitis in the left upper limb after chemotherapy. She was administered 6 sessions of low-level laser therapy. [Result] Her pain score decreased by 8 points. Her scores on the Patient and Observer scar Assessment Scale decreased by 18 points for the observer portion and by 26 points for the patient portion. [Conclusion] Low-level laser therapy is effective for the reduction of pain and the size of scar tissue in patients with superficial thrombophlebitis.

**Key words:** Superficial thrombophlebitis, Low-level laser therapy, Pain

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## INTRODUCTION

Superficial thrombophlebitis (ST) refers to an inflammatory alteration or infection in the wall of the superficial vein and is characterized by a progressive blood clot formation. The symptoms of ST are severe pain, skin erythema, hot flush, local edema, thickening, and painful tendon cords along the invaded vein<sup>1, 2)</sup>. The main cause of ST is intubation of the vein<sup>1)</sup>, vasospasm and pain are induced by anti-cancer agents<sup>3)</sup>. Injection of anti-cancer agents through an intravenous lock results in blood vascular side effects, including thrombophlebitis<sup>4)</sup>. Regarding the treatment for ST, medicinal therapy is chiefly used, whereas mild exercise, such as walking, is recommended. For alleviation of pain and symptoms, hot packs and compression using a bandage or stocking are often applied<sup>1)</sup>.

Because low-level laser therapy (LLLT) has stimulating effects on the body, it is effective for the stimulation of blood circulation, for the expansion of blood vessels, as an inflammatory reaction therapy, scar healing<sup>5, 6)</sup>, and for pain reduction in inflammatory diseases<sup>7, 8)</sup>. Although no previous studies have been explored the effects of physiotherapy on ST, LLLT has been proved effective for the treatment of inflammatory diseases that are similar to ST. Here, we report the effects of LLLT on ST after injection of an anti-cancer in

a patient with breast cancer.

## CASE REPORT

A 66-year-old woman underwent right mastectomy at H hospital on July 29, 2014. She developed ST after chemotherapy (CTx) was performed on the left accessory cephalic vein in September 2014. She did not receive any specific therapy for ST until January 2015. The patient showed understanding of the study purpose and provided written informed consent. The study was performed in accordance with the ethical principles of the Declaration of Helsinki. The patient visited the physiotherapy department on January 27, 2015. The level of pain, scar tissue, and circumference of the scar tissue were evaluated; furthermore, a bioimpedance analysis (BIA) of the ST site was performed. Pain was assessed using the Visual Analog Scale (VAS), and the pain score was 8. The scar tissue was assessed using the Patient and Observer Scar Assessment Scale (POSAS), and a score of 51 was obtained for the observer portion and a score of 48 was obtained for the patient portion. The circumference measurements were obtained using a tapeline; axillary, 10 cm above the elbow, at the elbow, 10 cm below the elbow, at the wrist, and at the palm<sup>9)</sup>. The measurements at the above mentioned sites were 27, 24, 21, 18, 14.5 and 18 cm, respectively, in the left upper limb, and 21 cm at the center of the ST site.

Regarding the BIA, the amount of moisture and moisture percentage were measured using Inbody S10 (Biospace, Seoul, Korea). The amount of moisture was 1,090 mL and the moisture percentage was 0.384% in the left upper limb. The patient received LLLT twice during the hospitalization (January 27 and 28). LLLT enabled vertical examination of the ST spot by using SUPER LIZER HA-2200 (Tokyo

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Iken, Tokyo, Japan) for 10 min. SUPER LIZER HA-2200 is the first linearly polarized light therapeutic equipment with a wavelength range of 600–1,600 nm. Because the patient was repeatedly hospitalized and discharged because of CTx, therapy was implemented for 6 times in total, including therapy performed on February 17 (1 time) and on March 9–11, 2015 (3 times). A reevaluation was performed on February 17, 2015, and the VAS score was found to be 4, whereas the POSAS score for the observer portion was 44 and that for the patient portion was 38 for the scar tissue. The circumference measurements were 27, 24, 21.5, 19, 15, and 18 cm, for the respective sites mentioned above, in the left upper limb, and 21 cm at the ST site. The BIA showed that the amount of moisture was 1,130 mL and the moisture percentage was 0.383% in the left upper limb. In a reevaluation performed on March 9, 2015, the VAS was 0, whereas the PASOS score for the observer portion was 35 and that for the patient portion was 22 for the scar tissue. The circumference measurements were 27, 24, 21.5, 20, 15, and 18 cm, for the respective sites mentioned above, in the left upper limb, and 21 cm at the ST site. The BIA showed that the amount of moisture was 1,010 mL and the moisture percentage was 0.393% in the left upper limb.

## RESULT

According to the results of the reevaluation on June 10, 2015, the pain VAS score decreased to 0, the POSAS score of the scar tissue decreased to 33 points for the observer portion and to 22 points for the patient portion. The circumference measurements for the respective sites mentioned above were 27, 23, 21, 19, 14.5, and 17.5 cm in the left upper limb, and 21 cm at the ST site. The BIA showed that the amount of moisture was 1,070 mL and the moisture percentage was 0.385% in the left upper limb, indicating no significant difference between the results of the last reevaluation and those of the reevaluation on June 10.

## DISCUSSION

We examined the effects of LLLT on ST in a breast cancer patient after therapy with an anti-cancer agent. LLLT decreased the pain score by 8 points; the observer portion of the POSAS, by 18 points in the scar tissue; and the patient portion of the POSAS, by 26 in the scar tissue. Circumference measurements and the BIA results did not differ significantly among the reevaluations. In particular, the effects of LLLT on the level of pain and scar tissue persisted up to the follow-up evaluation on June 10. Considering that no difference was observed in the circumference measurements and in the results of BIA among the reevaluations, ST was thought not have an impact on edema.

No direct previous studies have explored the effects of LLLT on ST. However, on examination of the previous literature on the effects of LLLT on inflammatory disease, we found a report by Jastifer et al.<sup>7)</sup> that showed pain reduction after application of LLLT to patients with plantar fasciitis. Furthermore, Eslamian et al.<sup>8)</sup> reported significant pain reduction, with the VAS score decreasing from 7.28 (0–10) to

3.12 after implementation of traditional physiotherapy and LLLT for patients with rotator cuff tendinitis. In this study, LLLT also reduced the level of pain although our patient presented with a different inflammatory disease, i.e., ST. Moreover, although no researcher has explored the effects of LLLT on scar tissue due to ST, Dirican et al.<sup>10)</sup> examined the impact of LLLT on the scar tissues of patients with breast cancer and showed that the of POSAS scores decreased in 76.4% of the research subjects. Moreover, LLLT has been thought to have similar effects on scar tissue due to ST. Although a clear mechanism is not clarified yet, factors such as mitochondria activation, adenosine triphosphate synthesis, protein synthesis stimulation, pH control inside and outside of a cell, and cell metabolism activation<sup>11)</sup> could have affected the results.

Here, we report the individual therapy results of a single ST patient. Because this study included only 1 case without a control group, the correlation between LLLT therapy and ST was not clearly investigated. Moreover, even though the scar tissue in ST was evaluated using POSAS, the evaluation method is not yet standardized. In the current situation, where specific research on physiotherapy for patients with ST is scarce, we experienced that LLLT was helpful for the reduction of pain and scar tissue. Confirmation of the sustained effects of LLLT on ST in a follow-up 5 months after the patient's first examination was particularly meaningful. Although the present study included only 1 case, we believe that it will open the doors for future large-scale studies on this topic; moreover, this study yielded positive research results.

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