

Complex physical therapy for scleroderma-like skin induration induced by taxane-based anticancer agents in a lymphoedema case after breast cancer surgery

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Key words

Lymphoedema, scleroderma-like skin induration, taxane-based anticancer agents

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Taxanes are commonly prescribed agents for the chemotherapeutic treatment of cancer. Several adverse effects are reported when using these agents, such as oedema and dermatological problems, including scleroderma-like skin induration (SLSI) (Maehana et al, 2010; Colson et al, 2013; Sibaud et al, 2016). Although the true incidence remains unclear, adverse dermatological effects are frequent and most patients who undergo chemotherapy are affected (Sibaud et al, 2016). SLSI is often seen on the extremities, especially on the lower legs, but it can also affect the upper extremities and other parts of the body. In breast cancer patients, it is often seen on the arm of the affected side and on both legs (Ogawa, 2011; Colson et al, 2013; Sato, 2016).

Skin induration does not occur in all patients, but once developed, it is difficult to treat and can cause severe limitations to

Abstract

Scleroderma-like skin induration (SLSI) induced by taxane-based anticancer agents is an adverse effect of chemotherapy that typically affects the extremities, especially the lower legs. Skin induration often remains after chemotherapy is complete, with a significant decrease in the patient's quality of life and the potential for severe restrictions in joint mobility. Treatment options are limited and often only of partial benefit. We would like to present our therapeutic approach to SLSI and a case of SLSI after breast cancer treatment that was successfully treated with Complex Physical Therapy.

joint mobility. The onset of skin changes is different in each person and the underlying mechanism is still not fully understood, but from biopsy results, it is known that the skin undergoes a fibrotic change with proliferation of collagen bundles in the dermis (Maehana et al, 2010; Sibaud et al, 2016). Drug-induced oedema tends to precede the scleroderma-like skin changes and sometimes progresses to lymphoedema (Behar et al, 1997; Colson et al, 2013; Sibaud et al, 2016). Patients often complain about stiffness of the skin and joints, experiencing difficulties in flexing and extending fingers, the wrists, and ankles (Sato, 2016). In the authors' therapy centre, several cases of SLSI have been treated successfully with complex physical therapy (CPT also known as decongestive lymphatic therapy [DLT]). In this article, the authors present their treatment approach and a case of SLSI after breast cancer.

Assessment

The authors' centre specialises in the conservative treatment of lymphoedema and lymphological diseases. Patients with a lymphological-related diagnosis who require conservative treatment are referred to this centre. Among those, some present with SLSI. Assessment begins with an interview between the therapist and the patient, a check of their medical history, contraindications and current complaints. This is followed by a careful skin inspection and palpation. SLSI patients in general have delicate, tense and hardened skin, but the degree of induration differs between the areas of the affected limb. A thorough skin check is, therefore, necessary to establish an optimal treatment plan. Joint range of motion is tested by flexing and extending the joints of the upper and lower extremities. Skin changes are monitored by ultrasound imaging and pictures.

Circumferences are taken to keep track of every treatment session outcome.

Therapy

SLSI patients are treated with CPT with a special focus on fibrosis-softening techniques. These are special massage techniques originally developed at the authors' centre consisting of light vertical pressure exerted by putting the aligned finger pads of both hands on the skin's surface, which then slowly sink into the skin (Figure 1). The fingers are kept in position, and the therapist conducts small circles with his finger pads where necessary. This movement is repeated, moving forward by the size of the therapist's finger pads to adjacent indurated areas.

During the whole process, pressure is not exerted from the fingers, but from the centre of the body and to an extent that does not trigger any adverse skin reactions. Before and after the fibrosis softening techniques are initiated, manual lymphatic drainage (MLD) is conducted on the indurated skin and on the oedematous areas to reduce the accumulated excess fluid and subsequently skin tension. MLD treatment is followed by bandaging. The therapist carefully wraps the affected limbs with a pressure appropriate to the skin condition. More delicate skin needs soft padding material and light pressure. Before bandaging, a pH-neutral lotion is applied to the skin to avoid irritations and to keep it moisturised. Exercises comprise active and passive flexion and extension of joints with repetitive fist-making and opening of the hands in the upper extremities of patients.

Case report: scleroderma-like skin induration after breast cancer

A 47-year-old woman diagnosed with International Society of Lymphology (ISL) stage II lymphoedema of the arm, non-pitting drug-induced oedema of both legs, partial sensory dysfunction of both lower legs to toes and SLSI of left wrist to fingers and lower legs to toes was referred to the Goto College Lymphedema Institute (Figures 2 and 3). Her major complaints were pain due to tension of the skin resulting from the swelling, and problems in moving the joints of the hand and foot due to hardened skin, which also caused problems when walking. Due to pain and sensory problems, she was not able to wear any compression garments.



Figure 1 (left). Fibrosis-softening technique.
Figure 2 (below left). Feet/ankles at initial visit.
Figure 3 (below right). Hand at initial visit.

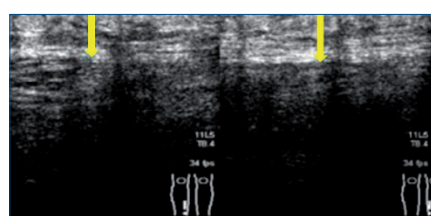
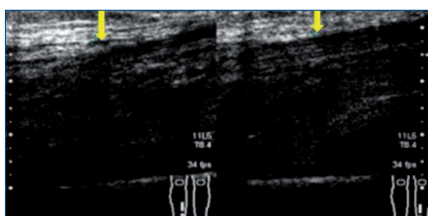


Figure 4 (above left). Ultrasound image at initial visit. Figure 5 (above right). Ultrasound image at last visit.

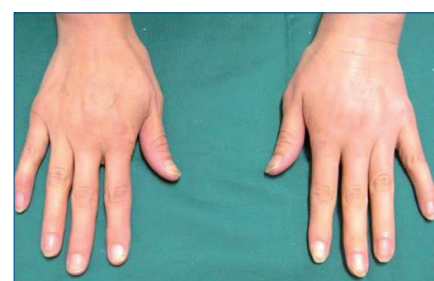


Figure 6 (above left). Feet/ankles at last visit. Figure 7 (above right). Hands at last visit.

The patient had undergone a mastectomy, including axillary lymph node dissection, for stage IIIB breast cancer of the left side followed by chemotherapy (FEC 100x4 and taxotere TXT 75x4) and radiation of the left thorax and regional lymph nodes with a dose of 150Gy. She developed lymphoedema of the arm and drug-induced oedema in both legs 6 months after surgery and skin induration became notable around the same time after the first administration of taxotere. CPT started another 5 months later upon referral to the authors' centre,

comprising skin care, manual lymphatic drainage, compression therapy and exercises, and continued for five sessions over 2 months with 90 minutes for each session. Between the sessions, the patient herself performed CPT in a self-care home programme. Treatment at the authors' centre included light vertical pressure fibrosis-softening techniques as explained above to especially address the indurated skin areas and low-pressure bandaging with a stockinette, cotton bandages, Idealbinde® and Comprilan® (both BSN

Table 1. Circumference changes between initial and last treatment (cm).

LEFT HAND	
Middle finger	-0.2
Dorsum of hand	-0.4
Wrist joint	-0.4
LEFT LOWER LEG	
Dorsum of foot	-1.5
Ankle	-1.6
Lower leg	-2.9
Knee	-1.1
RIGHT LOWER LEG	
Dorsum of foot	-2
Ankle	-1.7
Lower leg	-4
Knee	-2.3

Table 2. Range of motion changes between initial and last treatment (degree).

LEFT WRIST	
Palmarflexion (flexion)	+6°
Dorsiflexion (extension)	+5°
LEFT ANKLE	
Plantarflexion (flexion)	+4.6°
Dorsiflexion (extension)	+1.3°
RIGHT ANKLE	
Plantarflexion (flexion)	+6.7°
Dorsiflexion (extension)	+2.4°

Medical). The outcome of treatment was monitored by circumference measurement, range of motion measurement and ultrasound findings.

Treatment outcome

Circumference, skin elasticity, and ROM of wrist and ankle improved after the first treatment. Changes between the first and last treatment session were as follows: circumference decreased 0.4 cm at the dorsum of the hand, 2.9 cm and 4 cm at the lower left and right legs respectively, and 1.6 cm and 1.7 cm at the left and right ankle joints respectively. Details are summarised in *Table 1*. Range of motion improved as follows: wrist flexion (palmarflexion) +6° degrees, wrist extension (dorsiflexion) +5° degrees, ankle flexion (plantarflexion) left side

+4.6°, right side +6.7°, ankle extension (dorsiflexion) left side +1.3°, right side +2.4° (*Table 2*). Ultrasound findings showed a decrease in excess fluid in the subcutaneous fat layer and a decrease of the thickened fat layer of 4 mm (*Figures 4 and 5*). After the fourth treatment session, pain and sensory dysfunction improved significantly and enabled the patient to wear compression garments. After the last treatment session, the patient was able to walk without almost any pain or restrictions in joint mobility (*Figures 6 and 7*).

Discussion

Adverse events from taxane-based anticancer chemotherapy can have a severe impact not only on the patient's quality of life, but also on the drug

therapy plan itself, causing a possible temporary interruption, dose reduction or even termination of chemotherapy (Sibaud et al, 2016). SLSI does not occur in all patients and its onset is individually different, ranging from immediately after the first chemotherapy cycle to after completion of therapy. However, it seems that an onset after the second or third cycle is frequent (Ogawa, 2011; Sato, 2016).

Once developed, SLSI is difficult to treat, leaving the patient with a significant decrease in activities of daily living up to possible difficulties in walking. Taxane-induced oedema tends to precede SLSI and occurs due to enhanced fluid filtration followed by capillary protein leakage and can progress to lymphoedema (Behar et al, 1997; Colson et al, 2013; Sibaud et al, 2016). Reports about amelioration of skin changes and regressing oedema after discontinuation of chemotherapy with or without a combination of intense physical therapy and drug administration of prednisone, methotrexate, and others are published (Maehana et al, 2010; Colson et al, 2013; Sibaud et al, 2016). Early physical therapy is also considered as a possible measure to counteract SLSI. However, full recovery seems to be difficult (Colson et al, 2013).

CPT as described in the International Lymphoedema Framework Best Practice for the Management of Lymphoedema Document or International Society of Lymphology Consensus Document is the gold standard for the treatment of lymphoedema (International Lymphoedema Framework, 2006; ISL, 2016). In this case, the patient suffered from arm lymphoedema, drug-induced oedema of both legs, SLSI on the hand and lower legs, and pain and partial sensory dysfunction. Her symptoms did not improve after completion of taxane chemotherapy and she was referred to the authors' centre.

The patient's major complaints were pain due to tense skin from the swollen limbs and restriction in the movement of her wrist, fingers and ankle joints caused by SLSI. In addition to the oedema therapy, special attention was paid by the authors to the treatment of the hardened skin areas. Fibrosis-softening techniques were used intensively at every treatment

session to improve skin elasticity. To further improve the treatment outcome, the patient was asked to conduct a daily home programme of CPT, including skin care, self-massage, self-bandaging, and joint and hand-gripping exercises. Due to the delicate skin condition, pain and sensory problems, the authors applied only light pressure with a stockinette, some soft padding material wrapped in Idealbinde and Comprilan short-stretch bandages.

There are reports of effective treatment of SLSI by using CPT in combination with ultrasound or MLD as a single treatment method for hand oedema and hand function in systemic sclerosis (Maddali Bongli et al, 2011; Yoshikawa et al, 2011). To the best of the authors' knowledge, there is no study available that evaluates the outcome of CPT solely in the case of SLSI.

SLSI patients in general show less fluid retention than usual lymphoedema cases. Circumference changes after CPT are, therefore, limited but, nonetheless, significant, because they lead to a reduction in skin tension and pain, and also an improved range of motion as seen in this case.

Range of motion changes depend on the individual situation and body part

measured. Yoshikawa et al (2011), for example, report changes of an average of 16° for metacarpophalangeal joint movement, whereas in this case, the average was 4.3° for the wrist and ankle.

Yoshikawa et al (2011) could improve skin condition with the addition of ultrasound therapy to CPT. In this case, CPT alone led to significant amelioration in skin condition as shown in the ultrasound image (*Figures 4 and 5*). The patient's overall degree of satisfaction with the therapy outcome was also high.

Conclusion

Treatment options for the effects of SLSI are limited. Discontinuation of chemotherapy seems to be often the first choice, in combination with or without an intervention through drug and physical therapy. On the basis of the outcome of this case report, as well as from the authors' experiences from similar cases, it is recommended that CPT be considered as another option to treat SLSI. This is especially the case if patients present with concurrent lymphological conditions that necessitate conservative treatment, as CPT can be used to address both.

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