

The change in muscle properties of upper limb in breast cancer patients under radiation therapy

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Purpose

Radiation therapy is a fundamental part of cancer treatment but it occurs the onset of late adverse effects in the normal tissue, especially radiation-induced fibrosis. But, It is difficult to objectively assess the muscle properties. In order to understand and treat muscle tightness of breast cancer patients under radiation therapy, detailed information on the clinical course and muscle properties of upper limb is required. The aim of the current prospective study was to investigate the changes of muscle properties of upper trapezius (UTZ), sternoclavicular muscle (SCM), and pectoralis major (PM) in breast cancer patient under radiation therapy by serial follow-up (before, after radiation therapy and 4 months after end of radiation therapy) using a hand-held myotonometer.

Methods

The breast cancer patients who underwent surgery and scheduled radiation therapy were included. We measured muscle properties and subjective stiffness. Muscle properties were measured using Myoton, a noninvasive and small hand-held device expressed on a continuous scale. Subjective stiffness score is a 5-point scale, 1 means 'feel no stiffness', and 5 means 'feel very stiff'. Three measurements were taken before and after the radiation therapy, and four months after the end of the radiation therapy.

Results

The stiffness of PM was significantly higher in the affected side before radiation therapy. There were no statistically significant changes in other muscles. After radiation therapy, the tone of affected side PM was higher the elasticity was lower, and the stiffness was increased than the unaffected side. This pattern was similar 4 month after end of radiation therapy. Other muscles showed no significant difference. In the PM of the affected side, the tone gradually increased, the elasticity decreased, and the stiffness increased. All these values were statistically significant. The UTz of the affected side showed a similar pattern with the PM, but only stiffness was statistically significant. And there was no meaningful change in this scale and no correlation with the objective values on the subjective stiffness score.

Conclusion

In this study, there was no significant change in the properties of the SCM muscle. There was a significant difference in stiffness of the PM between affected and unaffected side

before radiation therapy. And it seems an effect of surgery. After radiotherapy, in PM muscle, the tone was increased, the elasticity was decreased, and the stiffness was increased. This change was significant and is thought to be the effect of radiation therapy. In affected side, the pattern of UTz was similar to that of the PM, which is presumed to be due to posture when receiving radiation therapy. There was no significant change in the subjective stiffness score and no correlation with the objective values. The study is considered to be an important resource in the rehabilitation for breast cancer patients after radiation therapy.