Physical Therapy Methods in the Treatment and Rehabilitation of Cancer Patients

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Abstract. The results of the effective use of magnetic laser therapy in the treatment and rehabilitation of cancer patients were presented. The effect of magnetic-laser therapy in the treatment of radiation-induced reactions in the patients with head and neck cancer and in the patients with breast cancer was analyzed. High efficiency of lymphedema and lymphorrhea treatment in the postoperative period in the patients with breast cancer was proved. The results of rehabilitation of the patients with gastric cancer after surgical treatment were presented. These data indicate a high effectiveness of different physical methods of treatment and rehabilitation of cancer patients.

INTRODUCTION

The development and introduction of new and the improvement of existing methods of diagnosis, treatment and prevention of malignant tumors can improve life expectancy of cancer patients. However, successful treatment should be evaluated not only by the survival rates, but also by the number of people who are able to become full members of society [1].

Radiotherapy is indicated for most patients and is often accompanied by the acute radiation-induced skin and mucosal injuries [2–7].

Physical therapy is of great importance in the treatment and rehabilitation of patients with various diseases. Physical therapy has been traditionally considered a contraindication for the treatment of cancer patients. In recent years, however, the interest in the use of physical therapy methods in oncology has greatly increased.

Physical factors that do not stimulate tumor process, including the magnetic field, lasers of different spectrum of light wave and super high frequency therapy (SHF), are definitely preferred.

Thus, the low-intensity laser irradiation (LILI) has anti-inflammatory, immunocorrective and analgesic effects as well as promotes wound healing and helps to restore a balance between the components of the nervous system. There are published reports that say that the emission of low-intensity lasers does not affect the frequency of spontaneously induced mutagenesis, and laser therapy is not a contraindication for patients with premalignant lesions [8–10]. Long-term studies on the effects of LILI on malignant tumors demonstrated a direct inhibitory effect of laser radiation on the tumor cells [11]. Good results were obtained in the treatment of purulent inflammatory

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complications in patients with laryngeal, pharyngeal and oral cavity cancers as well as in the treatment of postoperative complications in patients with esophageal and gastric cancers.

At P. Herzen Moscow Oncology Research Institute the technique of LILI was used in the pre- and postoperative period as well as intraoperatively for diseases of the cardiovascular system, respiratory and digestive systems, as well as for the purpose of pain relief, prevention and treatment of various complications of combination therapy. Analyzing the treatment outcomes in more than 1,000 patients we found out that none of the patients had exacerbation of the underlying disease and adverse effects [12].

The use of millimeter wavelength radiation for experimental animals showed that extremely high frequency (EHF) therapy has an inhibitory effect on the development of transplanted sarcoma and extends life span of animals.

The proliferation of donors' bone marrow cells after radiotherapy and chemotherapy was found to be increased. The increased survival of experimental animals was observed only in those cases when EHF therapy was preceded by chemotherapy or ionizing radiation. If ionizing radiation was followed by EHF therapy, the radiation-induced side effects were observed [13].

The EHF therapy is especially effective in combination with surgery or chemotherapy and radiotherapy. In the preoperative period, the EHF therapy allows some concomitant diseases to be controlled. In the postoperative period, the EHF-therapy reduces the risk of complications, including purulent-septic complications, hemorrhagic and atonic syndromes, and accelerates the wound healing.

No direct contraindications to the EHF-therapy for cancer patients were found [1, 14]. The low intensity of the magnetic field was reported to have no damage to the tumor cells. The magnetic field was applied in the treatment of skin, lower lip, lung, breast, cervix, stomach, colon and external genitalia cancers and treatment of skin, lower lip and vulva cancers was shown to be the most effective [15, 16].

MATERIALS AND METHODS

Between 2002 and 2015, a total of 582 patients were treated at the Tomsk Cancer Research Institute. Out of these patients, there were 56 with gastric cancer, 190 with head and neck cancer and 336 with breast cancer. The physical therapy methods included magnetic laser therapy used alone and in combination with other therapeutic physical factors. The following magnetic laser devices were used: Milt-F, Mustang 2000, Creole, Magniter, Skenar and magnetic applicators.

TREATMENT AND REHABILITATION OUTCOMES IN GASTRIC CANCER PATIENTS

Short-and long-term rehabilitation outcomes in 56 gastric cancer patients were studied. Pain was the most common patient complaint in early postoperative period. Before magnetic- laser therapy, the patients had endoscopic evidence of esophagitis, gastritis and anastomosis insufficiency. On 10–12 day after surgery, patients received magnetic-laser therapy using the infra-red laser beam with a frequency of 25–50 Hz, magnetic flux density of 25–50 mTl for 30 s to 2 min per field. The procedure was performed daily or every other day after taking mineral water. The treatment area encompassed the epigastric region from the xiphoid process down to the regions of the stomach, liver, pancreas, intestine and point GI 4 [17].

Magnetic-laser therapy resulted in a significant reduction in the frequency of esophagitis from 63% to 22%, gastritis from 21% to 1%, anastomositis from 81% to 20% and anastomosis insufficiency from 30% to 15%. For the assessment of pain intensity, the visual analogue scale (VAS) was used. The pain score decreased from 7.8 to 4.3 points after 3 treatment sessions and it was 1 point after 5 treatment sessions. However, 5–8 procedures were required for complete pain relief. After completion of the treatment, complete pain relief was achieved in 99.6% of the patients.

Long-term treatment outcomes were assessed in 19 patients who underwent radical surgery for gastric cancer. All patients suffered from pain, gastrointestinal inflammation and violation of the motor-evacuation function. The patients received 3–5 sessions of magnetic-laser therapy with a frequency of 80 Hz and output power of 0.25–0.50 W, for 30–60 s. The treatment area included the epigastric region. Four-six days after completion of this treatment, 4–5 additional sessions of magnetic-laser therapy were performed every other day alternating with 4–5 procedures of sinusoidal alternating magnetic field for 1–2 min with a magnetic induction of 10 μT for 10–15 min [18].

On day 5 after the start of therapy, the intensity of pain decreased by 50%, and by the end of the treatment course, the pain was controlled completely in 100% of patients. Endoscopic examination, performed 1 month after completion of treatment, showed elimination of gastric mucosal inflammation in 98% of the patients. The study of the quality of life as a criterion for the assessment of treatment and rehabilitation outcomes was carried out using the European Organization for Research and Treatment of Cancer (EORTC) Quality of Life Core Questionnaire (QLQ-C30). The performance status of the patients had increased from 75.1 to 85.2 items, resulting in increased disability and decreased fatigue.

EFFECTS OF TREATING RADIATION-INDUCED DAMAGE TO NORMAL TISSUES IN PATIENTS WITH HEAD AND NECK CANCER AND IN PATIENTS WITH BREAST CANCER

A total of 286 patients with radiation-induced skin and mucosal injuries were included into the study. The patients were divided into 2 groups. Group I consisted of 190 patients with head and neck cancer and group II comprised 96 patients with breast cancer.

The group I patients had grade I-II radiation-induced epidermitis and grade I-II epithelitis. Pain syndrome was observed in 82% of cases. For the pain assessment, a 4-point visual analogue scale (VAS) was used. Hoarseness was observed in 52% of patients, difficulty swallowing in 33% of cases and poor passage of food in 15% of patients. On physical examination, hyperemia of the skin and mucous membranes were observed in 64% of cases and tissue edema in 30% of cases.

In Group II patients grade I-II radiation-induced epidermitis were also observed. Following neutron therapy moist desquamation occurred in some patients. Pain syndrome was observed in 73% of breast cancer patients. Tenderness and limited range of motions in the shoulder joint on the affected side were noted in 3% of patients. Heart rhythm disorder (sinus tachycardia and supraventricular arrhythmia) seen on an ECG was observed in 10 patients.

All patients of both groups underwent magnetic-laser therapy. The first signs of health improvement were registered in 30% of head and neck cancer patients with radiation-induced skin damage after the first procedure and in 27% of cases after 3 treatments.

Health improvement was observed in 62% of breast cancer patients with radiation-induced skin reactions after the first 3 treatments and in 23% of patients after the fifth treatment. After completion of treatment, no radiation-induced injuries were observed. To achieve a therapeutic effect in the patients with breast cancer, an average of 8–12 procedures with a minimum of 5 treatments and a maximum of 15 treatments had to be done. In the patients with head and neck cancer, fewer treatments were required (range: 5 to 8 sessions) [19].

EFFECTS OF LYMPHORRHEA TREATMENT IN PATIENTS OPERATED ON FOR BREAST CANCER

The study included 150 women and 2 men, who underwent surgery for breast cancer. Radical mastectomy was performed in 90 patients and breast-preserving surgery in 62 patients.

The patients were divided into 3 groups depending on the volume of lymphorrhea. Group I: 11 patients with the lymphorrhea volume to 20 ml (7.2%), group II: 129 patients with the lymphorrhea volume to 100 ml (84.8%) and group III: 12 patients with the lymphorrhea volume of more than 100 ml (7.8%).

Magnetic-laser therapy was administered to all patients. However, in group III patients, the 8-th treatment was combined with SCENAR therapy [20].

Treatment outcomes were assessed by the cessation of lymphorrhea. There was no lymphorrhea in 92% of group I patients, in 62% of group II patients and in 51% of group III patients. A restoration of sensitivity and shoulder mobility was observed in all 3 groups. No complaints were observed after completion of therapy. Thus, the most favorable treatment effect was seen in group 1 patients with the least amount of lymphorrhea. However, lymphorrhea in the volume of more than 100 ml required additional treatment sessions (up to 15 procedures) in combination with SCENAR therapy.

EFFECTS OF LYMPHEDEMA TREATMENT IN PATIENTS WHO UNDERWENT SURGERY FOR BREAST CANCER

Eighty-eight patients with arm lymphodema after breast cancer surgery were treated with magnetic-therapy treatment. Feeling of heaviness and arm swelling were the main patients' complaints. Limited shoulder joint mobility due to arm swelling was observed in 15 patients, sensitivity changes in 12 patients and mild pain in the area of the shoulder join in 26 patients. The arm circumference was measured to assess the treatment outcomes using the classification of post-mastectomy edema of the upper extremity. The patients were daily treated with infrared laser with magnetic field intensity ranging from 20 to 50 mT, pulse repetition frequency of 80 Hz, and output power of 0.5 to 1.0 W. The treatment field covered the area of the affected extremity, axilla, shoulder and back. The exposure time was 1.5–2.0 min. The treatment course consisted of 10–15 procedures [21].

CONCLUSION

Physical therapy was shown to be effective for the treatment and rehabilitation of cancer patients. Despite the encouraging results, further studies of the effects of physical therapy in management of cancer patients should be undertaken to determine the optimal physiological and physical parameters to obtain the most effective clinical response.

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The study reported in this article was conducted according to accepted ethical guidelines involving research in humans and/or animals and was approved by an appropriate institution or national research organization.

The study is compliant with the ethical standards as currently outlined in the Declaration of Helsinki.

All individual participants discussed in this study, or for whom any identifying information or image has been presented, have freely given their informed written consent for such information and/or image to be included in the published article.

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