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CANCER TREATMENT: ROLE OF YOGA, NATUROPATHY AND PRAYER

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INTRODUCTION

Behavioral or psychological factors such as chronic stress may influence occurrence or progression of cancer through several mechanisms:

1. Influence of stress on natural killer (NK) cells.
2. Poorer repair of damaged DNA.
3. Modulation of apoptosis.
4. Oxidative stress: aggravated by psychological stress

Stress and natural killer cells

NK cells are the surveillance cells of immune system, capable of destroying tumor cells and infected cells. Stressors have been demonstrated to decrease lymphocyte proliferation and reduce NK cell cytotoxicity[1]. Also, the cytokines- interferon ? and interleukin -2 (IL-2) which otherwise enhance NK cells and lymphocyte activated killer (LAK) cell activity get suppressed due to stress[2]. Smoking may play a synergistic role (in conjunction with psychological factors) and may further reduce NK cell cytotoxicity. Suppression of NK cells and its functions may lead to onset and/or progression of cancer.

Stress and DNA repair

Carcinogens induce tumors by damaging cellular DNA[3]. Body's defense processes repair this damage so as to prevent the occurrence of cancer. Ability to repair damaged DNA, however is impaired in those with depression[4]. Some of the animal studies have also suggested that stress may alter the DNA repair processes[5]. Thus, inability to repair DNA damage may lead to cancer.

Stress modulates apoptosis

Apoptosis is a genetically programmed process, which leads to alteration in cell structure and eventual suicide. This process helps elimination of damaged cells, which would otherwise induce carcinogenesis; stress, however, impairs this process[6].

Oxidative stress: aggravated by psychosocial stress

Though oxygen is the most critical nutrient of life, it is also the source of free radicals or reactive oxygen species (ROS). ROS are generated either during the normal metabolic processes of the body or due to external agents such as radiation, ultraviolet light, cigarette smoke, and environmental pollutants such as asbestos, pesticides etc[7,8]. ROS provide a state called as oxidative stress, which is aggravated by psychosocial stress[9], and leads to many diseases including atherosclerosis, coronary heart disease (CHD), rheumatoid arthritis, and cancer.

An antioxidant is a substance that scavenges ROS. The body is equipped with antioxidant defense in the form of glutathione and antioxidant enzymes such as superoxide dismutase (SOD), catalase and glutathione peroxidase. Balance between the levels of ROS and antioxidant defense in the body would determine as to whether a person remains healthy or suffers from one of the chronic diseases including cancer, as mentioned above.

From the foregoing, it is apparent that psychologic stress could induce cancer and/or may cause its progression through a variety of mechanisms including suppression of immune system, faulty repair of DNA, modulation of apoptosis and through aggravation of oxidative stress.

Behavioral interventions

Behavioral interventions in the form of relaxation techniques have been studied to see if these could improve immune functions and/or antioxidant defense and may have positive effects on patients suffering from cancer. NK cell activity has been demonstrated to increase by many researchers[10, 11]

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with the help of relaxation techniques. Those patients with malignant melanoma (skin cancer) who underwent relaxation program for six weeks had significant increase in the percentage of NK cells, as well as increase in NK cell cytotoxicity as also lower rates of recurrence and deaths related to their cancer compared to those, who did not undertake this program[11]. Weekly supportive group therapy with self-hypnosis led to longer survival[12] and/or better quality of life[13].

Sudarshan Kriya, Pranayam, and Yoga

Yoga, meditation and pranayam are centuries old, time tested processes; these are known to relax mind and energize the body. Recently, Sudarshan Kriya has been introduced by Sri Sri Ravi Shankar ji. The process is introduced to participants through a 22-24 hour structured program called as Art of Living (AOL) workshop, spread over 6 days. Sudarshan Kriya - rhythmic cyclical breathing of slow, medium and fast cycles is preceded by Ujjayi Pranayam - slow breathing 3 cycles per minute; it is a forced inspiration and expiration against airway resistance, Bhastrika Pranayam - rapid exhalation at 20 -30 cycles per minute and brief 'Om' chanting. These processes are practiced while sitting with eyes closed and awareness focused on breath. Process ends with a ten minutes rest in a tranquil supine position. This can be followed by a 20-minute meditation.

Effect of Sudarshan Kriya and Pranayam on Blood Lactate Levels

Blood lactate levels increase during tension and anxiety; lowering of blood lactate indicates a state of relaxation and has been demonstrated during the practice of transcendental meditation (TM) in the earlier studies [14]. Police trainees in the age group ranging between 21- 27 years were included in two groups in a study conducted at our center. Experimental group underwent AOL workshop and practiced Sudarshan Kriya (SK) and Pranayam (P) for a period of 5 months. Control group with similar age range, living in similar conditions and undergoing similar physical exercises, was not exposed to SK and P. Blood lactate was measured in both the groups at the end of 5 months. Four-fold lower level ($t = -2.265$, $P = 3.118e-10$) of blood lactate was observed in practitioners of SK and P (Fig. 1). There was further fall in blood lactate level during SK and P at 45 minutes ($t = 3.072$, $P = 0.013$) and at 65 minutes ($t = 4.123$, $P = 0.0006$); there was negligible change in the blood lactate levels in the case of controls [15].

Effect of Sudarshan Kriya and Pranayam on Antioxidant Status

In the two groups of police trainees studied for blood lactate levels as described above, glutathione and antioxidant enzymes, superoxide dismutase (SOD) and catalase were measured at the end of 5 months of practice of SK and P [15]. Glutathione levels were significantly higher in practitioners of SK and P Vs non - practitioners ($t = 6.968$, $p = 2.038 e-06$), shown in Fig. 2. The basal value of catalase was also higher in practitioners, compared to non-practitioners ($p = 0.0016$). Similarly, significantly higher values of SOD were obtained in practitioners of SK and P compared to non-practitioners ($t = 4.727$, $p = 0.0001415$). These results have been graphically represented in Fig. 3 and 4.

Figure 1: Bar diagram showing the comparison of lactate levels (mean (S.E.) in controls and in practitioners of SK&P at various time points during Kriya.

Figure 2: Bar diagram showing the comparison of glutathione levels (mean (S.E.) in controls and in practitioners of SK&P at various time points during Kriya.

Figure 3: Bar diagram showing the comparison of catalase activity (mean (S.E.) in controls and in practitioners of SK&P at various time points during Kriya.

Figure 4: Bar diagram showing the comparison of SOD activity (mean (S.E.) in controls and in practitioners of SK&P at various time points during Kriya.

TM program has been shown to decrease psychosocial stress [16]. Epidemiological data [14,16] and controlled clinical trials [17] have suggested that lower rates of CHD morbidity and mortality are associated with long-term practice of TM in older subjects. In addition, rate of cancer and aging have also been reported to be lower in TM practitioners [14]. Though such studies are not available for SK and P, better antioxidant status achieved through regular practice, as highlighted above, would be consistent with the possibility that regular practice of SK and P might reduce the incidence of CHD and cancer and other age related chronic diseases.

Effect of Sudarshan Kriya and Pranayam on T cell Subsets and Natural Killer Cells

T cell subsets and NK cells, recognized as important cellular components of immune system, were studied in 17 AOL teachers (had been practicing SK and P for at least 2 years), 17 cancer patients (already treated, under remission) and 63 normal subjects of either sex; age range 18 - 65 yrs [18]. Major lymphocyte subsets were estimated quantitatively in the peripheral blood using two-color flowcytometry technique.

Total T-cell and its T helper subset were significantly higher in AOL teachers and normal controls compared to cancer patients. However, there was no significant difference in these cells between AOL teachers and normal controls. A significant difference was found in NK cells, which were significantly higher ($p < 0.001$) in AOL teachers compared to normal controls and cancer patients, please refer to Fig.5. No significant difference was seen in NK cell population between normal subjects and cancer patients in remission [18].

Subsequently, 21 cancer patients, who had already been treated and were either in remission or having stable response, underwent AOL workshop and practiced SK and P for 6 months. Six cancer patients, similarly treated, under follow up but not exposed to SK & P were taken as controls. Blood samples for T cell subsets (CD 3 +, CD 4+ and CD 8+ cells) and NK cells were taken from both groups at day 0, day 8, week 12 and week 24. There was no significant difference between the population of T cell subsets among control group and experimental group; neither was there any difference in the experimental group from day 0 to week 24. However, NK cell population of experimental group showed a statistically significant increase ($p<0.05$) at 12 and 24 weeks compared to baseline. Increase in NK cells at 24 weeks in the experimental group was also significantly higher ($p <0.05$) compared to control group (unpublished data).

In summary SK and P, as highlighted above, induces relaxation, increases antioxidant defense and NK cells in the body. These observations would have important implications for cancer: as they would suggest that (i) SK and P may have a preventive role against cancer (ii) SK and P may be effective as a secondary preventive measure, after curative treatment of cancer and (iii) in metastatic cancer, SK and P may delay progression of cancer, improve survival and/or quality of life.

Figure 5: Bar diagram showing percentage of NK cells in peripheral blood, as obtained by flowcytometry, in normal subjects, AOL teachers and cancer patients

Meditation

Meditation is art of doing nothing with eyes closed. One gets into the awareness of nothingness (emptiness) or infinite space. Several techniques are available to make one reach a meditative state. Meditation can play a useful role for cancer patients. It can relieve the stress and the physical and emotional pain. Meditation can be helpful to some people in dealing with side effects of treatment and in overcoming the sense of loss of control and to gain mastery over their lives. It may be most useful when treatments have ended and the person is attempting to return to normal activities as a survivor. It can also help the people to change lifestyle to promote health and reduce the risk of recurrence [19].

Meditation has been used to great advantage in caring for terminally ill and dying patients in hospice settings and at home. This involves the use of meditation to relieve physical and emotional pain and suffering due to the disease. It is used to best advantage when integrated into a comprehensive palliative care approach, which includes, if desired discussing death and dying and feeling of loss within the context of mindfulness practice and the states and thoughts that arise during meditation and other times. Many dying patients also find that calmness and silence of meditation bring profound feeling of acceptance, well being and inner peace [20]. Healthy persons at higher genetic risk of cancer also may be drawn to meditation to reduce environmental and life style risk factors and to control anxiety and stress.

All these techniques can be helpful to patients with cancer. Their practice enhances the coping ability of patients. These measures change the hopeless and helpless attitude to the active fighting spirit. They reduce the stress associated with the diagnosis as well as treatment of cancer. By reducing the stress they may alter the treatment outcome. On account of the positive effect of meditation on NK cell cytotoxicity and consequent up regulation of immune system, meditation can lead to prevention as well as progression of cancer.

Naturopathy

Naturopathy is a system of medicine that uses natural substances to treat the patient and recognition that the patient's mental, emotional, and physical states must all be treated for a lasting effect. The foundation of Naturopathic medicine is laid on philosophy of the "healing power of nature." This means that within every human organism there is a healing energy, which includes our immune system, which is responsible for our wellness and our ability to heal and maintain health. It is premised that the therapies used to support and stimulate this healing power of nature must be in "the gentlest, least invasive, most efficient manner possible". Naturopaths do not simply treat the manifestation of the disease but rather search for the cause and treat it.

To accomplish these goals, naturopathic medicine incorporates many therapeutic modalities: herbal medicine, homeopathy, nutrition, hydrotherapy, food, exercise therapy, physical therapy, manipulation of the bony and soft tissues, and lifestyle and counseling.

There is no scientific evidence that naturopathic medicine can cure cancer or any other disease. Specific methods within naturopathic medicine vary in terms of effectiveness. Some methods may be of little value, while others may prevent and/or control symptoms. Examples include the importance of diet in lowering the risk of severe illnesses such as heart disease and cancer, and the usefulness of acupuncture to reduce pain.

Many herbal remedies have shown to have anticancer effects. Essiac, Iscador, and pau d' arco tea are the few herbal drugs popular in USA. Several mushroom derived compounds are approved for use as cancer treatment in Japan. There are suggestions that a Chinese formula containing herbs may be weekly estrogenic and may be of use in the treatment of prostate cancer [21]. Another Chinese herb was found to have inhibitory properties against breast cancer cells[22]. Garlic (diallyl- disulfide) inhibited the growth and induced apoptosis in human colon cancer cell lines[23]. Polyphenolic compound (Resveratrol) found in plant species and food products (grapes, peanuts and herbs) had similar effect [24]. Major component in green tea, enhanced the growth inhibitory effects of 5 flourouracil (chemotherapeutic agent) [25].

Research carried out at AIIMS has shown that antioxidants and ginger (Zingiber officinale) [26] had useful antiemetic effect in animals (cats and dogs) undergoing cisplatin chemotherapy; human trials are awaited. Ocinum Sanctum [27] had antiproliferative and chemo preventive effects; thus it has the potential as an anti-cancer agent. Maha Amrit Kalash enhanced immune status of cancer patients undergoing treatment. A study done by our group at cancer center showed that high doses of multiple antioxidant vitamins along with chemotherapy (Carboplatin and Paclitaxel) enhanced apoptosis of non-small cell cancer cells H520 [28]. Clinical study also demonstrated that combination of chemotherapy and antioxidant vitamins yielded better response rate and longer survival.

Prayer

Researchers are finding that religion and spirituality do indeed have significant effects on health. These can be linked to cancer in many ways. First, religion encourages their members to refrain from certain activities, which are carcinogenic such as: alcoholism, smoking, unsafe sexual practices etc. Second, active participation in a religious group provide certain types of cognitive support that is beneficial for patients in coping with disease and its treatment. Religion can influence the ways in which individual perceives and handles problems. They can encourage the individuals to perceive the problem in a more positive way, which may mitigate mental distress that would otherwise occur.

CONCLUSIONS

In summary, there is substantial evidence to link psychological stress with immune dysregulation in individuals with cancer. Stress relieving techniques like SK&P, meditation, yoga, and prayer have been found to be effective in maintaining both mental and physical health. These techniques can be incorporated in the management of cancer patients to potentiate the effects of conventional treatment.

REFERENCES

1. Zorrilla EP, Luborsky L, McKay JR, Rosenthal R, Houldin A, Tax A, McCorkle R, Seligman DA, Schmidt K. The relationship of depression and stressors to immunological assays: a meta-analytic review. Brain Behav Immun. 2001; 15:199-226
2. Glaser R, Rice J, Speicher CE, Stout JC, Kiecolt-Glaser JK. Stress depresses interferon production by leukocytes concomitant with a decrease in natural killer cell activity. Behav Neurosci. 1986; 100: 675-8.
3. Setlow RB. Repair deficient human disorders and cancer. Nature. 1978; 271: 713-7.
4. Kiecolt-Glaser JK, Stephens RE, Lipetz PD, Speicher CE, Glaser R. Distress and DNA repair in human lymphocytes. J Behav Med. 1985; 8: 311-20.
5. Glaser R, Thorn BE, Tarr KL, Kiecolt-Glaser JK, D'Ambrosio SM. Effects of stress on methyltransferase synthesis: an important DNA repair enzyme. Health Psychol. 1985; 4: 403-12
6. Tomei LD, Kiecolt-Glaser JK, Kennedy S, Glaser R. Psychological stress and phorbol ester inhibition of radiation-induced apoptosis inhuman peripheral blood leukocytes. Psychiatry Res. 1990; 33: 59-71.
7. Halliwell B. Reactive oxygen species in living systems: source, biochemistry and role in human disease. Am J Med. 1991; 91: 14S-22S.
8. Raij L, DeMaster EG, Jaimes JA. Cigarette smoke-induced endothelium dysfunction: role of superoxide anion. J Hypertens. 2001; 19: 891-897.
9. Scarpellini F, Sbracia M, Scarpellini L. Psychological stress and lipoperoxidation in miscarriage. Ann NY Acad Sci. 1994; 709: 210-213
10. Kiecolt-Glaser JK, Glaser R, Wiliger D et al. Psychosocial enhancement of immunocompetence in a geriatric population. Health Psychol 1985; 4: 25-41
11. Fawzy IF, Kemeny ME, Fawzy NW et al. A structured psychiatric intervention for cancer patients. Arch Gen Psychiatry 1990; 47: 729-735
12. Spiegel D, Bloom JR, Kraemer H, Gottheil E. Effect of psychosocial treatment on survival of patients with metastatic breast cancer. Lancet 1989; 2: 888-901
13. Goodwin PJ, Leszcz M, Ennis M et al. The effect of group psychosocial support on survival in metastatic breast cancer. N Engl J Med 2001; 345: 1719-1726
14. Schneider RH, Nidich SI, Salerno JW. The Transcendental Meditation program: reducing the risk of heart disease and mortality and improving quality of life in African Americans. Ethn Dis 2001; 11: 159-160
15. Sharma H, Sen S, Singh A, Bhardwaj NK, Kochupillai V, Singh N. Sudarshan Kriya practitioners exhibit better antioxidant status and lower blood lactate levels. Bio Psychol 2003; 63: 281-291
16. Alexander CN, Robinson P, Orme-Johnson DW. Effects of TM compared to other methods of relaxation and meditation in reducing risk factors morbidity and mortality. Homeostasis 1994; 35: 243-264
17. Zamarra JW, Scneider RH, Besseghini I, Robinson DK, Salerno JW. Usefulness of the TM program in the treatment of patients with

coronary artery disease. Am J Cardiology 1996; 78: 77-80

18. Das SN. Flowcytometric study of T-cell subset and natural killer cells in peripheral blood of Art of Living teachers, normal subjects and cancer patients. Proceedings Science of Breath. International symposium on Sudarshan Kriya, Pranayam and Consciousness. All India Institute of Medical Sciences 2002. pp 47-49.

19. Cunningham AJ, Edmonds CV. Group psychological therapy for cancer patients: a point of view, and discussion of the hierarchy of options. Int J Psychiatry Med. 1996; 26: 51-82

20. Goleman DJ, Schwartz GE. Meditation as an intervention in stress reactivity. J Consult Clin Psychol. 1976; 44: 456-66.

21. DiPaola RS, Zhang H, Lambert GH, Meeker R, Licitra E, Rafi MM, Zhu BT, Spaulding H, Goodin S, Toledano MB, Hait WN, Gallo MA. Clinical and biologic activity of an estrogenic herbal combination (PC-SPES) in prostate cancer. N Engl J Med. 1998; 339: 785-91.

22. Tagliaferri M, Cohen I, Tripathy D. Complementary and alternative medicine in early-stage breast cancer. : Semin Oncol. 2001; 28: 121-34.

23. Sundaram SG, Milner JA. Diallyl disulfide induces apoptosis of human colon tumor cells. Carcinogenesis. 1996; 17: 669-73.

24. Delmas D, Rebe C, Lacour S, Filomenko R, Athias A, Gambert P, Cherkaoui-Malki M, Jannin B, Dubrez-Daloz L, Latruffe N, Solary E. Resveratrol-induced apoptosis is associated with Fas redistribution in the rafts and the formation of a death-inducing signaling complex in colon cancer cells. J Biol Chem. 2003; 278: 41482-90.

25. Masuda M, Suzui M, Weinstein IB. Effects of epigallocatechin-3-gallate on growth, epidermal growth factor receptor signaling pathways, gene expression, and chemosensitivity in human head and neck squamous cell carcinoma cell lines. Clin Cancer Res. 2001; 7: 4220-9.

26. Sharma SS, Kochupillai V, Gupta SK, Seth SD, gupta YK. Antiemetic efficacy of ginger (Zingiber officinale) against cisplatin induced emesis in rats. J Ethnopharmacol 1997; 33: 185-188

27. Prakash J, Gupta SK. Chemopreventive activity of Ocimum sanctum seed oil. J Ethnopharmacol. 2000; 72: 29-34

28. Pathak AK, Singh N, Khanna N, Reddy VG, Prasad KN, Kochupillai V. Potentiation of the effect of paclitaxel and carboplatin by antioxidant mixture on human lung cancer h520 cells. J Am Coll Nutr. 2002 Oct; 21(5): 416-21.