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Lipid peroxidation and antioxidant status in fibrocystic breast disease with and without sudarshan kriya yoga

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Abstract:

Background: Sudarshan kriya yoga (SKY) is a unique breathing process advocated by The Art of Living foundation, Bangalore, India. Yogic breathing exercises decreases lipid peroxidation and improves antioxidant status in blood. This study aims to evaluate lipid peroxidation markers Malondialdehyde (MDA) and nitric oxide (NO) together with total antioxidant capacity (TAC) in fibrocystic breast disease patients.

Method: Lipid peroxidation markers i.e. Malondialdehyde (MDA) and nitric oxide (NO) together with total antioxidant capacity (TAC) were evaluated using spectrophotometer (Elico Company) in serum of 30 fibrocystic breast disease patients with routine treatment (control group) and 30 fibrocystic breast disease patients with routine treatment along with sudarshan kriya yoga (SKY) (study group). Blood samples were collected from study group after 7 days of regular practice of sudarshan kriya yoga (SKY).

Result: Serum MDA and NO were significantly decreased ($p<0.001$) with concomitant elevation levels of TAC in study group when compared to control group ($p<0.001$). Relationship between lipid peroxidation markers i.e. MDA and NO with total antioxidant capacity TAC were inversely related in both groups.

Conclusion: Sudarshan kriya yoga practice may improve natural defense system / mechanism and decreases efficacy of oxidative stress in fibrocystic breast disease. However further extensive and long term studies to be done to prove these findings and understand the basic mechanism involved.

Key word: fibrocystic breast disease, MDA, NO, TAC, sudarshan kriya yoga

Introduction:

Benign lesions of breast are the most common lesion which accounts for 90% of clinical presentation related to breast.[1] Of the all breast disorders, palpable breast lump is second most common presentation, the pain being the first.[2]

Fibrocystic breast disease is usually benign (non cancerous) condition. Presentations include swollen, tender breast and/or one or more lumps. For the majority of women symptoms are temporary discomfort; however some women experience severe pain.[3] Frequently symptoms worsen just before a menstrual cycle and lessen near the end.

The etiology of breast cancer is multifactorial. Significant breast cancer risk factors include age (early age at menarche, late age of menopause, late age of first pregnancy), obesity, oral contraception, HRT (hormone replacement therapy), diet, family history of benign breast disease.[4]

Cells in the tissues and organs are continuously being subjected to oxidative stress and free radicals on daily basis. Free radicals are capable of altering all major classes of biomolecules, such as lipids, nucleic acids and proteins with changes in their structure and functions.[4] Prime targets of free radicals are polyunsaturated fatty acids in cell membrane and their interaction results in lipid peroxidation. As breast tissue is loaded with lipid they are more susceptible to oxidative insults. Normally the free radical is counter acted by the cells antioxidant system without damage to the cellular DNA. As age of the woman increases, cellular protection may become less effective and DNA damage is faster.[5]

The levels of free radical molecules are controlled by various cellular defense mechanisms, consisting of enzymatic (catalase, glutathione peroxidase, superoxide dismutase) and non-enzymatic (vitamin E and C, glutathione) components.[6]

Yoga, an ancient Indian science has been practiced as a healthy way of life. Recently, yoga has been adopted as an approach to health within alternative medicine.[7] Sudarshan kriya yoga (SKY) is unique breathing process advocated by The Art of Living foundation, Bangalore, India. The foundation is one of the renowned established yoga schools of international standard. SKY is based on rhythmic breathing exercise called sudarshan kriya, body posture (asana), controlled breathing (pranayama) and relaxation of mind (meditation). SKY is said to heal and purify from within and is a natural and non invasive technique.[7] SKY has a sound scientific basis and is an ideal tool for improving the health .The practice of yoga has beneficial effect on biochemical and physiological functions.[8]

A study conducted in All India Institute of Medical Sciences (AIIMS) New Delhi showed better antioxidant status both at the enzyme activity and at RNA level in SKY practitioners. This was companied by better stress regulation and better immune status due to prolonged life span of lymphocytes by up regulation of anti-apoptotic genes and proscervival genes in these subjects. Thus it was concluded that SKY practice may exert effects on immunity aging cell death and stress regulation.[9] We planned to undertake a study of the effect of SKY on lipid peroxidation and antioxidants which includes Malondialdehyde (MDA), Nitric oxide (NO) and total antioxidant capacity (TAC) in subjects undergoing SKY workshop at Datta Meghe Institute of Medical Sciences (DU), Sawangi (M), Wardha.

Materials and Methods:

The present study was carried out in 9 month in the department of biochemistry, JNMC, Datta Meghe Institute of Medical Sciences (DU), Sawangi (M), Wardha, Maharashtra, India. The ethical committee clearance obtained from the appropriate authority appointed by the institution.

In this study, a total 60 subjects of age group 20-40 yrs [Mean Age Control Group=31.33 and Study Group=29.47] were included and divided into groups. Control group included 30 subjects of fibrocystic breast disease had received only modern medication. Study Group included 30 subjects of fibrocystic breast disease of group on modern medication and daily practice of sudarshan kriya yoga (SKY) for 6 days. An informed consent was obtained from the participants. They underwent sudarshan kriya training for 6 days organized in Wardha by Art of Living trained teacher. These 6 days training includes following components[10]

1. Yoga-asana,
2. Three stage pranayama with ujjayi or “victory of breath”
3. Three sets of Bhastrika or “Bellow’s Breath” and
4. Sudarshan Kriya or the “Healing of Breath Technique”.

They were practiced in that order. The breathing practices (Pranayama & Bhastrika) are done in vajrasan posture, on the carpet spread over the floor. Eyes are kept closed throughout the sessions. Normal breathing is at the rate of 14 to 16 breaths per minute. Ujjayi (victorious of Breath) is a slow and deep breathing technique at 2 to 4 breaths per minute.[10]

Three-stage of Pranayama with ujjayi breath is an advanced form using a specific ratio of inhalation, exhalation and breath holds. Participants practice these components where specific arm positions are held for approximately ten minutes in total. It involves taking a breath for a period of 4-10 seconds, holding one's breathe in the exhaled.[10] The second breathing component of sudarshan kriya is Bhastrika. Here the breathing is vigorous and faster, about twenty to thirty respiratory cycles per minute. Three approximately one-minute rounds of Bhastrika are followed by a few minutes of normal breathing. Arm movements are used to increase the force and depth of inhalation and exhalation. Practice of this component lasts for approximately five minutes.[10] The central component of sudarshan kriya is an advanced cyclical breathing exercise of slow, medium and fast rates in succession. Slow breaths are about 20 respiratory cycles per minute, medium breaths are about 40-50 respiratory cycles per minute and fast breathing are about 60-80 cycles per minute. The participant rotates through these breathing patterns during sudarshan kriya. The number of breaths, intensity and sequence of cycles various depending upon whether the kriya is done with an instructor or whether it is done as a short home practice (three repetitions of 20 slow, 40 medium and 40 rapid cycles).[10] Blood sample was collected from the all subjects and study group after one week practicing SKY and assessed for Total antioxidant capacity (TAC), Lipid peroxidation markers i.e. Malondialdehyde (MDA) and Nitric Oxide (NO). Serum MDA measured by modified Okhawa method[11] and serum NO measured by cadmium reduction method[12] to measures the oxidative stress. Plasma total antioxidants capacity (TAC) by FRAP method.[13]

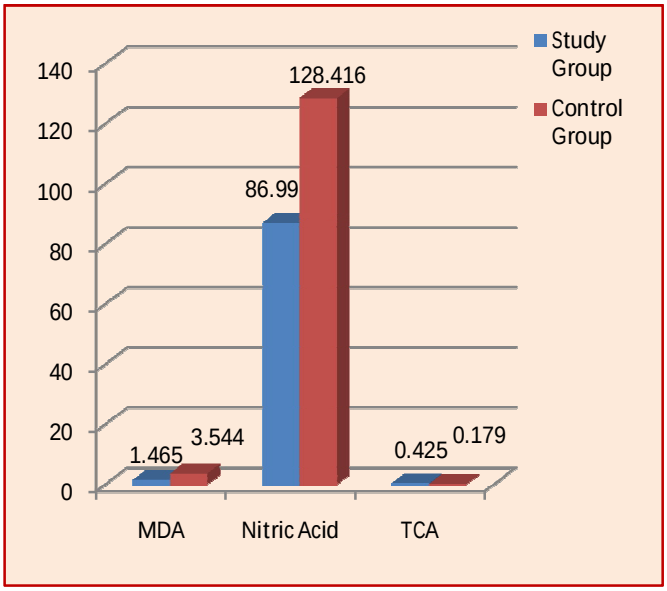
Results:

For statistical analysis software SPSS 21.0 Version s were used.

Table: 1 Showing values of MDA, NO and TAC in Fibrocystic breast disease with SKY (Study group) and fibrocystic breast disease without SKY (Control group).

Parameter	Mean		Standard Deviation		P Value
	Study	Control	Study	Control	
MDA (nmol/ml)	1.465	3.544	0.331	0.565	0.001
NO (µmol/L)	86.990	128.416	10.828	21.945	0.001
TAC (µmol of trolox/ml)	0.425	0.179	0.119	0.049	0.001

Table: 02 Bar diagram showing comparison of serum MDA, NO and TAC in Fibrocystic breast disease with SKY and Fibrocystic breast disease without SKY (study and control group).



Discussion:

The health of an individual depends on stress. Stress can be social, psychological or physical. Increasing

evidence suggests that stress, especially oxidative stress, induces DNA damage and contributes to the pathophysiology of several diseases.[14] Every individual is exposed to oxidative stress and there is inter individual variation in antioxidant defense and DNA repair ability. Psychological stress has been shown to increases oxidative stress. Relaxation is the tendency of a physiological system to return to its original state and is a compensatory mechanism. Sudarshan Kriya Yoga (SKY) includes yoga-asana, pranayam, advanced cyclic breathing exercise (i.e. Sudarshan Kriya) and meditation. By doing SKY body gets enough oxygen which can alleviate cellular metabolism.

Cell membranes are rich sources of polyunsaturated fatty acids are readily attached by free radical damaging membrane protein, making the membrane leaky producing lipid hydro peroxides. These lipid hydro peroxides break down to short chain toxic component known as Malondialdehyde (MDA).[14] MDA and Nitric oxide both are used to measure of oxidative stress. The defense systems include a network of antioxidant in RBC'S and blood. But we have included total antioxidant capacity to measure total antioxidant status.

Present study was undertaken to compare the MDA and Nitric oxide as a marker of oxidative stress and total antioxidant capacity in fibrocystic breast disease with and without sudarshan kriya yoga. This study demonstrate that levels of serum MDA and Nitric oxide were decreased after 6 days of SKY practice (MDA-mean=1.465, p value=0.001; NO-mean=86.990, p value=0.001) as compared to the values without SKY(MDA-mean=3.544, p value-0.001; NO-mean=128.416, p Value-0.001) which was statistically significant. It was observed that total antioxidant capacity were significantly elevated after 6th day of SKY practice (mean=0.425, p value-0.001) as compared to the values without SKY group (S.D=0.179, p value-0.001) were significantly lower.

It was also observed that the relationship between lipid peroxides, nitric oxide and total antioxidant capacity are inversely related in all groups.

Geetha H et al[15] observed that levels of E-SOD and blood GSH –PX were lower in the participants before SKY practice and the same were significantly increased after 7th and 45th day of SKY practice. There was significant decrease in serum MDA levels after 7th and 45th day of SKY practice.

Sharma H et al observed that SKY decreases lipid peroxidation as evidenced by improved status of antioxidants e.g. SOD (Super Oxide Dismutase), glutathione and decreased level of MDA in SKY practitioners.[16] A yogic breathing exercise decreases lipid peroxidation as evidenced by decreased level of MDA in plasma.[17]

Conclusion:

SKY has a strong tendency towards an increase in total antioxidant capacity and decreasing MDA and NO. Thus SKY practice may enhances the body's natural defense mechanism by improving the quality of life by preventing damage caused by oxidative stress.

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