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RESEARCH ARTICLE

THE CLINICAL SIGNIFICANCE OF ONE YEAR OF YOGA PRACTICE ON BIOCHEMICAL, IMMUNOLOGICAL AND INFLAMMATORY MARKERS IN RHEUMATOID ARTHRITIS PATIENTS

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ABSTRACT

Aim: Present study was aimed to find out the effect of yoga on physical symptoms, routine blood parameters, immunological and inflammatory markers.

Materials and Methods: Total of 72 rheumatoid arthritis patients were enrolled and divided in two groups. Control group included 36 patients taking allopathic medication. Treatment group included 36 patients taking yoga along with allopathic medication. The study intended to evaluate the effect of one year of yoga intervention on joint swelling, morning stiffness, ESR, RA factor, IL-6, liver Function tests (LFT) and kidney function tests (KFT).

Results: In yoga group, a more significant reduction in morning stiffness and joint swelling ($p < 0.001$) was observed as compared to control group. Reduction in ESR was only in yoga treatment group ($p < 0.01$). However no significant effect was observed in RA factor, IL-6 or LFT in the group undertaking yoga. It was observed that in yoga group creatinine values decreased ($p < 0.01$).

Conclusion: Significant reduction in morning stiffness, joint swelling and ESR in patients who underwent regular yoga emphasizes importance of natural healing measures in order to limit inflammation in RA. Unaltered levels of inflammatory marker IL6 point to the importance of other forms of physical therapies, which if included along with yoga may play a better role in arresting RA earlier and in a better way.

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INTRODUCTION

Rheumatoid arthritis is chronic and debilitating disorder associated with considerable physical and psychological symptoms. There is uncontrolled inflammation of joints and surrounding tissues that may not be reversible.

Speedy and aggressive early treatment can reverse morbidity and can measurably improve outcome for patients with RA (Stenger et al., 1998). The only way to reduce inflammation in RA is to follow an anti inflammatory lifestyle. Consistently attacking RA by some anti inflammatory agents, some yoga exercises to keep the joints supple, pranayama to release toxins and stress, supplements to improve immune system and massage to repair joint damage for 2-3 months at a stretch reverses it, reducing the inflammation and the pain.

Physical activity is often integrated into treatments but there was once a fear in the medical community that exercise would increase joint inflammation. The American College of Rheumatology note that in addition to the general benefits of regular exercise, certain kinds of exercise have shown important benefits for people with arthritis. For persons with arthritis, the movements of yoga are important components of a safe, gradual conservative exercise programme (Bartlett, 2015). In last few years people have become aware of usefulness of yoga in relation to health and diseases. The best part of these practices is that, it is something that can be done comfortably even at home and there is no side effect reported so far in yoga.

The main aim of the present study is to reduce inflammatory symptoms associated with the advancement of joint deterioration by yoga therapy which forms a complete exercise plan involving physical, physiological and psychological

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faculties of human being. This has been found to significantly influence the musculo-skeletal system and is of great help for persons suffering from chronic illnesses (Yoga Research and Education, 2003). The present study was planned to find out therapeutic potential of yoga for one year in patients suffering from RA. The effect was evaluated by studying the physical parameters like morning stiffness, joint swelling and correlating with IL-6. Routine blood parameters for LFT and KFT, ESR and RA factor were also studied. The goal of treatment was to study the regression of symptoms in patients suffering from RA.

MATERIALS AND METHODS

The study was conducted in department of research, Bapu Nature Cure Hospital in collaboration with department of Biochemistry, GIPMER. A total of Seventy two radiologically and serologically proven RA patients were enrolled and divided in two groups. Group 1, the control group included 36 patients taking allopathic medication Group 2, the treatment group included 36 rheumatoid arthritis patients taking naturopathy, yoga and allopathic medication. Written consent was taken from all the patients and ethical guidelines were followed during the study. The study had due approval from ethical committee of the institution. Rheumatoid arthritis patients satisfying the American College of Rheumatology criteria for rheumatoid arthritis were recruited by inclusion and exclusion criteria (American College of Rheumatology, 2002) after baseline investigation patient were given intensive information, education and counselling about risk factor of the disease and importance of naturopathy and yoga. After their awareness and counselling about the disease, naturopathy and yoga modalities were administered to patients

Treatment

Yoga Therapy: The yoga therapies (20 min), practiced were Pawanmuktasana part I (anti-rheumatic), Shavasana and Pranayama (Bhramari, Kapalhati, Deep breathing and Nadisodhana) (Gheranda Samhita).

The total treatment period for each patient was one year. Therapies were administered thrice a week on alternate days for first two months (1-2) then followed by twice in a week for the next four months (3-6) and in last six months (7-12) once a week.

On days without session, patients were advised to continue this practice for 20-25 minutes at home. The daily adherence to this program was evaluated by analyzing questionnaire that was collected every month. The treatment was modified or omitted to avoid strain, whenever there was any inflammation in the joints. Naturopath and yoga therapist followed the specific recommendations of orthopaedic surgeon for safe and healthy execution of treatment.

Allopathic Medicines

For delay in progression of RA, allopathic treatments were used in conjunction with naturopathy and yoga regime. The

prescribed disease modifying drugs were Methotrexate, Sulfasalazine and Hydroxy chloroquine. For better management of the disease conditions, drugs like calcium and folate were also administered as per specific requirement. The doses were kept stable and the participants were asked to consult rheumatologists at the end of every month to review the medication. Principles of treatment remained same in both the groups and doses were modified according to the activity of disease.

Parameters Studied

Physical parameters

1. Morning stiffness- In our study morning stiffness of the patients was noted from 0 (no morning stiffness) to 10 (severe morning stiffness) scale(Phillips and Dow, 2012). Patients were categorized according to their response: mild (rating of 1-3), moderate (4-7) and severe (8-10) morning stiffness.
2. Joint swelling - Joint swelling is the build up of fluid in the soft tissue surrounding the joint. When a joint is affected by arthritis, inflammatory in particular, abnormal amounts of fluid build up and making the joint swollen. Swollen joints of the patients were scored on a 0-3 scale such as 3- severe, 2-moderate, 1-mild and 0-normal (Thompson *et al.*, 1987) .This was based on observation and palpation.

Biochemical parameters

Blood chemistry was used to determine physiological and biochemical states and organ function. Following serum test of patients were were estimated spectrophotometrically

- Liver function tests- Serum glutamate oxaloacetate transferase (SGOT), Serum pyruvate oxaloacetate transferase (SGOT), alkaline phosphatase (ALP), Total Protein, Albumin, Total Bilirubin
- Kidney function tests- Urea, Creatinine

Immunological markers

-RA factor Rheumatoid factor (RF) - The blood samples were taken for Rheumatoid factor (RF) prior to the intervention and after a period of 12 months (Hermann *et al.*,1986)

Inflammatory markers

- Erythrocyte sedimentation rate (ESR): - was measured by Westergren and Wintrobe Methods (David and Sykes, 1951)
- Interleukin 6 (IL-6) levels were estimated in both groups using commercially available ELISA kits (Dichrome).

Statistical Methods

Results are expressed as mean \pm standard deviation (SD). Student's paired t test (two-tailed) from baseline to 12 months was computed.

Table 1 Changes in Joint swelling, Morning stiffness in control and yoga group before and after a period of 12 months.

Variable in degrees	Assessment	Control group (MEAN ± SD)	Treatment group (MEAN ± SD)
Joint swelling (0-3 numerical value scale)	Before	2.1±0.7	2.1±0.7
	After12 months	1.6±0.97*	1±0.97***
	P value	0.015	<0.00001
Morning stiffness(0-10 cm scale)	Before	5.33±1.79	4.71±1.99
	After12 months	3.94±2.19**	3.1±2.02***
	P value	0.0043	0.000454

*p < 0.05, **p < 0.01, ***p < 0.001

Table 2 Values of inflammatory markers (ESR and IL6) and immunological marker (RA factor) in control and yoga group before and after a period of 12 months.

Variable in degrees	Assessment	Control group (MEAN ± SD)	Treatment group (MEAN ± SD)
ESR(mm/hr)	Before	44.92±29.11	53.64±21.73
	After12 months	36.61±17.01	39.17±16.47**
	P value	0.143	0.0011
IL6(pg/ml)	Before	4.30±3.90	6.60±5.91
	After12 months	3.30±4.15	4.75±8.94
	P value	0.294	0.155
RA factor(U/ml)	Before	120.94±93.99	164.56±117.71
	After12 months	127.06±91.79	142.25±105.15
	P value	0.598	0.075

*p < 0.05, **p < 0.01, ***p < 0.001

Table 3 Values of Liver function tests and kidney function tests in control and yoga group before and after a period of 12 months.

Parameter	Assessment	Control group (MEAN ± SD)	Treatment group (MEAN ± SD)
Bilirubin (mg/dl)	Before	0.59±0.18	0.63±0.36
	After12 months	0.56±0.21	0.57±0.48
	P value	0.473	0.270
Protein (gm/dl)	Before	7.11±0.69	7.45±0.49
	After12 months	7.22±0.62	7.40±0.68
	P value	0.496	0.368
Albumin(gm/dl)	Before	3.90±0.55	3.90±0.37
	After12 months	4.06±0.47	4.01±0.42
	P value	0.196	0.173
SGOT(U/L)	Before	32.94±25.45	30.89±11.96
	After12 months	28.94±12.42	29.89±14.06
	P value	0.399	0.345
SGPT(U/L)	Before	23.25±10.61	28.83±18
	After12 months	26.39±14.60	27.97±17.43
	P value	0.300	0.372
ALP(U/L)	Before	101.50±24.26	110.38±47.42
	After12 months	106.47±29.05	114.19±53.06
	P value	0.433	0.323
Urea(mg/dl)	Before	23.97±6.50	23.75±7.11
	After12 months	26.25±6.13	24.86±6.81
	P value	0.130	0.278
Creatinine(mg/dl)	Before	0.91±0.15	0.87±0.15
	After12 months	0.85±0.19	0.74±0.20**
	P value	0.144	0.00218

*p < 0.05, **p < 0.01, ***p < 0.001

A significant reduction in Joint swelling (p<0.001) was observed in yoga group as compared to control group taking allopathic treatment (p<0.05). Morning stiffness also decreased significantly (p<0.001) in yoga group as compared to control group taking allopathic treatment (p<0.01) (Table1).

Levels of ESR were statistically lower only in treatment group (p<0.01). Level of IL6 did not show significant reduction in any of the groups. RA factor values increased in control group

but were decreased in yoga group patients. But the reduction observed in treatment group was not significant (Table 2).

In yoga group creatinine values decreased significantly (p<0.01) as compared to control group of patients taking only allopathic medicine (Table 3).

DISCUSSION

Physical exercise routines have been found to be useful alternatives for the conservative management of RA. Yoga therapy has been found to be curative as well as preventive. This study intended to evaluate the effect of yoga training on various biochemical parameters based on the hypothesis that yoga has anti stress and anti inflammatory action in RA individuals and long term regular yoga practice help in lowering inflammatory markers. In this study, we examined the potential advantages of yoga therapy on physical symptoms and levels of immunological and inflammatory markers associated with the disease.

The present study of one year of yoga for RA was able to demonstrate statistically significant reduction in morning stiffness and joint swelling. Given that individuals with RA often suffer from depression and anxiety symptoms, a physically active regimen that also provides cognitive and emotional benefits may be especially effective for reducing disability in such individuals (Shih *et al.*, 2006 and Matcham *et al.*, 2013) The patients in our study experienced good relief in pain, swelling and stiffness of muscles. Some patients in the treatment group were able to decrease or discontinue allopathic medications. In a prospective cohort study yoga was found to reduce pain symptoms, increase mindfulness, and decrease cortisol levels (Curtis *et al.*, 2011). This shows that natural healing measures can control inflammation and pain in RA patients.

Mechanistic explanations for yoga's potential mental and physical health benefits have highlighted reductions in sympathetic nervous system tone (Riley, 2004), and increases in vagal activity (Bernardi *et al.*, 2001) both of which could have favourable endocrine and immune consequences, including lower inflammation. Yogic practices can be used as psycho physiologic stimuli to increase endogenous secretion of melatonin, which, in turn, might be responsible for improved sense of well-being (Harinath *et al.*, 2004).

Treatment group of our study showed a significant reduction in ESR, a sign of inflammation marker.ESR fluctuates easily depending on the metabolic activity of red blood cells (Voeikov and Dmitriev, 1998) . Psychological stress activates the oxidation process at membrane lipid level, modifying its permeability, which may increase ESR (Vitrichenko, 1985). Possibly the decrease ESR after yoga practice represents one more consequence of yoga's anti stress effect, reducing the oxidation process and release of free radicals at RBC membrane level(Ospina *et al.*,2007). The basic factor influencing the ESR after yoga training has been understood as decrease in amount of fibrinogen, which directly correlates with ESR (Malcolm and Brigdam 1999; Chouhan *et al.*, 1984) Hence practice of yoga not only relaxes the body, mind and

emotions; it regulates the metabolism also (Kumar and Pandya 2012; Purohit et al., 2013)

In treatment group of our study the reduction observed in IL-6 was not significant. Although it has been found that regular physical activity is associated with lower levels of IL-6 and other pro inflammatory cytokines. It may be that acute exercise transiently boosts production and release of IL-6 from skeletal muscles; the IL-6 that is released during physical activity inhibits TNF-alpha production and can induce IL-10 production, one mechanism underlying exercise's anti-inflammatory function (Pedersen and Febbraio, 2008)

For RA factor a decrease was observed in yoga group and an increase in values was seen in control group. But the changes in values were not significant. May be, besides yoga, including exercises or naturopathy measures may help in reducing inflammatory markers. This was observed in one of our studies carried out on a group of RA patients who were given naturopathy (massage and hydrotherapy) along with yoga therapy. It was observed that one year of Yoga and naturopathy intervention resulted in decrease of RA factors and pro inflammatory marker IL6 (Ranjna et al 2015).

In the present study creatinine levels were significantly reduced in yoga group as compared to control group. Research has seen that Kapalbhathi pranayama and Anulom vilom pranayama enhance and improve the power of the kidneys. It lowers down the creatinine level in the blood of kidney failure patient. Since studies of yoga have suggested potential benefits for patients suffering from RA, this practice may have particularly strong appeal if it is found to be preferentially capable of eliciting and maintaining patient adherence (Ebnezar et al., 2012, Cramer et al., 2013)

The goal of our study was to find role of yoga in limiting inflammation and its effect on levels of pro inflammatory cytokine IL6 in RA patients. It has been observed that although yoga can help RA patients in coping with swelling and morning stiffness, but other form of physical intervention therapies or naturopathy measures, like message therapy, if included along with yoga therapy may yield better results in achieving lower levels of pro inflammatory cytokine and immunological marker.

CONCLUSION

This study was an attempt to interrupt the inflammatory symptoms with the help of yoga therapy and points to its significance in controlling joint swelling, morning stiffness and ESR. Inclusion of other forms of physical therapies along with yoga may help in arresting RA earlier and in a better way.

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