



ISSN: 2230-9926

Available online at <http://www.journalijdr.com>

IJDR

**International Journal of
DEVELOPMENT RESEARCH**

International Journal of Development Research
Vol. 5, Issue, 05, pp. 4461-4467, May, 2015

Full Length Research Article

EFFICACY OF NATUROPATH AND YOGA ON TREATMENT OF RHEUMATOID ARTHRITIS: A ONE YEAR STUDY

*¹Chawla Ranjna, ²Thakur Gaurav, ³Mahajan Bhawna, ⁴Aparna, Gupta Vinod K. and ⁵Nair Rukamani

¹Department of Biochemistry, Room no. 411, Academic Block, GIPMER, JLN Marg, New Delhi 110002

²Bapu Nature Cure Hospital and Yogashram, Gandhi Nidhi, Mayur Vihar Phase 1, Delhi-91 (India)

^{3,4,5} Department of Biochemistry, Room no. 413, Academic Block, GIPMER, JLN Marg, New Delhi 110002

⁶Bapu Nature Cure Hospital and Yogashram, Gandhi Nidhi, Mayur Vihar Phase 1, Delhi-91

ARTICLE INFO

Article History:

Received 05th February, 2015
Received in revised form
09th March, 2015
Accepted 19th April, 2015
Published online 31st May, 2015

Key words:

Rheumatoid factor (RF),
Disease Activity score- a 28-joint count (DAS28),
Visual analogy scale (VAS),
Health assessment questionnaire (HAQ),
ESR.

ABSTRACT

Aims: Aim of study was to determine the effect of Naturopathy (massage, hot and cold fomentation applications) and yoga intervention for one year on the disease activity, disability and quality of life indices in patients suffering from Rheumatoid arthritis.

Methods and Material: The effect was observed on physical parameters (health assessment questionnaire, disease activity score including a 28-joint count, weight, grip strength and finger squeeze test), blood pressure, haemoglobin, immunological marker (Rheumatoid factor) and inflammatory marker (ESR). Total of Seventy five rheumatoid arthritis patients were enrolled and divided in two groups. Group 1 included 39 patients taking Allopathic medication. Group 2 included 36 patients taking Naturopathy and yoga along with Allopathic medication.

Results and Conclusions: Significant improvement was found in grip strength, finger squeeze test and ESR in treatment group. The improvement was also observed in DAS-28 score, HAQ and VAS in both the groups i.e control and treatment group but improvement was statistically more significant in the treatment group. The study concluded that massage therapy, hot and cold fomentation along with yoga therapy, when used in conjunction with other prescribed treatments, can have a positive systemic effect in getting symptomatic remission and in the effective management of Rheumatoid arthritis.

Copyright © 2015 Chawla Ranjna et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Rheumatoid arthritis (RA) affects the structural integrity and function of musculoskeletal joints and eventually the entire body (Osborn, 2005). The immune system mistakenly attacks the membranes and joint structures via the accumulation and stagnation of synovial fluids, initiating inflammation, pain and loss of function (Lowe, 2006). Pain can negatively affect a person's quality of life and impede recovery from illness or injury. Once diagnosed of RA, patients generally spend their lifetime using traditional and alternative therapies attempting to manage and decelerate the debilitation process (Werner, 2005). Treatment for Rheumatoid Arthritis requires rectification of lifestyle with the use of non-conventional

modalities. Increasing attention is now given to the patient's own help in controlling the disease. The current approach is attempt to interrupt the inflammatory symptoms associated with the advancement of joint deterioration, minimize the occurrences of intense pain episodes and decreased joint mobility, and subside the condition into a remission phase. One of the pain management strategies to consider was massage therapy, which may be of help for manually controlling symptoms in people suffering from rheumatoid arthritis. Thermotherapy is also a commonly used modality in treating rheumatoid arthritis. Thermotherapy modality included for this study was Fomentation Therapy, a form of Hydrotherapy -- Hot and Cold water applications. Physical activity is also an essential part of the effective treatment of rheumatoid arthritis and yoga is one of the best types of exercises for treatment of RA. Yoga has been used as a means to explore the exterior and interior world and ultimately to achieve wisdom and knowledge of the sacred Indian texts: the

*Corresponding author: Chawla Ranjna

Department of Biochemistry, Room no. 411, Academic Block,
GIPMER, JLN Marg, New Delhi 110002

Vedas, Upanishads, and Shastras (Feuerstein, 1989). It forms a complete exercise plan as it involves physical, physiological and psychological faculties of human being which significantly influences the musculo-skeletal system and especially helpful for persons suffering from chronic illnesses. For delay in progression of RA, allopathic treatment may be used in conjunction with naturopathy and yoga regime. The physical and psychological control and relaxation induced by these therapies may be of great help in getting symptomatic remission and in better management of the disease. Keeping in view the aforesaid, the present study was planned to find out therapeutic potential of naturopathy and yoga for one year in patients suffering from RA. The effect was evaluated by studying the parameters like finger squeeze test and grip strength, HAQ, VAS, DAS-28, ESR and diastolic BP. The goal of treatment was to study the regression of symptoms like joint pain, swelling, visible deformity and muscle weakness.

MATERIALS AND METHODS

The study was conducted in department of research, Bapu Nature Cure Hospital in collaboration with department of Biochemistry, GB Pant Hospital. A total of Seventy five radiologically and serologically proven RA patients were enrolled and divided in two groups. Group 1 included 39 patients taking Allopathic medication Group 2 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 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

Naturopathy Treatment (Kellogge, 1918)

a) Massage: patients were provided massage to the affected parts using warm sesame oil having anti-inflammatory properties (50 ml per sitting) for 30 minutes. Following techniques were used:

- a. Stroking
- b. Friction
- c. Kneading
- d. Percussion
- e. Vibration

Massaging directly to the inflamed joint was avoided in the treatment course. During inflammation massage was given to the areas which were above and below the affected joints to reduce inflammation.

b) Hot and cold fomentation was provided to every patient for 11 minutes – hot fomentation for 5 minutes and cold

fomentation for 30 seconds for two rounds. This was followed by a heating compress (using a dry cotton cloth and woolen flannel) for 10 minutes. The temperature of both hot fomentation (40°- 45 °C) and cold fomentation (18°- 26 °C) was controlled well during the treatment period. The duration of cold therapy was less than heat therapy. This was because effect of cold is known to last longer than heat.

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

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

There may not be one best test for measuring disease activity in RA, but over years a number of methods have been devised. These include patient questionnaires, joint counts, lab tests etc. In this study therapeutic effect of yoga was finally assessed with the following parameters

Standard rheumatologic measurements: weight, BP, Hb, grip strength, finger squeeze test and ESR were recorded

Health Assessment Questionnaire (HAQ): HAQ is measurement of functional disability. Functional improvement in Activities of Daily Living (ADL) was studied by the Indian version of Health Assessment Questionnaire (HAQ) (Kumar *et al.*, 2002). The Indian HAQ comprises of 12 questions (nine basic and three advanced activities of daily living i.e. dressing, bending, walking etc. on the standard HAQ format) relevant to Indian population. The score of 0,1,2,3 being given for without difficulty, with some difficulty, with much difficulty and unable to perform respectively. The total score divided by 12 gives the Disability Index (range 0-3).

Visual Analogue Scale (VAS): Pain intensity was measured on Visual Analogue Scale (VAS) (McCormack *et al.*, 1988), which features a horizontal line usually 10centimeters (100 mm) in length, with the words 'NO PAIN' on the left and 'WORST PAIN' on the right; the patient makes a mark on the line to indicate the point on the spectrum that reflects how he or she is feeling.

Disease activity score (DAS-28): Disease activity was evaluated by using DAS-28 test (Van der Heijde, 1990) using four variables –tender joint count, swollen joint count, ESR and patient's general assessment of disease activity. The test, generates a disease activity score (DAS) based on an examination of 28 joints in the shoulders, arms, hands and knees. DAS28 combines a joint count, lab test (either the ESR or CRP) and VAS. For calculating DAS28 the following formula was used:

$$\text{DAS28} = 0.56 * \text{square root (tender28)} + 0.28 * \text{square root (swollen28)} + 0.70 * \ln (\text{ESR}) + 0.014 * \text{VAS}$$

The DAS-28 provides with a number on a scale from 0 to 10 indicating the current activity of the rheumatoid arthritis of patient. A DAS-28 above 5.1 means high disease activity whereas a DAS-28 below 3.2 indicates low disease activity. Remission is achieved by a DAS-28 lower than 2.6

Inflammatory marker- Patients were tested for inflammatory markers: ESR mm/1st hr (Westergren 1957).

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

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.

RESULTS

A significant improvement was found in grip strength ($p < 0.001$), finger squeeze test ($p < 0.001$), ESR ($p < 0.05$) and RA factor ($p < 0.001$) in only treatment group. A significant improvement was observed in DAS-28 score ($p < 0.01$ in control vs. $p < 0.001$ in treatment group), VAS ($p < 0.001$ in both the groups) HAQ ($p < 0.05$ in control vs. $p < 0.001$ in treatment group) BP (diastolic) ($p < 0.05$ in control vs $p < 0.001$ in treatment group) in both the groups and the improvement observed was statistically more significant in treatment group as compared to control group (Table 1). At the start of the treatment 94.4 % of patients belonging to group 1 had high disease activity where as 94.7% of the patients enrolled for treatment group had high disease activity. After twelve months of allopathic treatment in control group and naturopathy, yoga along with allopathic treatment in treatment group, it was observed that patients with high disease activity reduced to 72.2% (from 94.4 %) and 21.6% (from 91.7%) in control and treatment group respectively.

Table 1. Values of different variables in control and treatment (Naturopathy and yoga) group before and after a period of 12 months

Variable	Assessment	Control group (MEAN \pm SD)	Treatment group (MEAN \pm SD)
Weight(Kg)	Before	62.386 \pm 14.564	67.441 \pm 11.781
	After12 months	62.431 \pm 15.026	67.026 \pm 10.769
	P value	0.9897	0.8713
BP SYSTOLIC BP (mm Hg)	Before	123.67 \pm 10.35	122.77 \pm 11.66
	After12 months	124.56 \pm 6.04	123.64 \pm 12.46
	P value	0.6573	0.7505
BP DIASTOLIC BP (mm Hg)	Before	78.22 \pm 5.67	79.95 \pm 5.76
	After12 months	75.39 \pm 5.34*	73.95 \pm 3.80***
	P value	0.0326	0.001
grip strength (0-2 scale)	Before	1.22 \pm 0.72	1 \pm 0.61
	After12 months	0.94 \pm 0.75	0.43 \pm 0.15***
	P value	0.1106	0.001
finger squeeze test(0-2 scale)	Before	1.25 \pm 0.69	1.1 \pm 0.64
	After12 months	1 \pm 0.79	0.43 \pm 0.15***
	P value	0.1571	0.001
Hb(g/dl)	Before	11.37 \pm 1.72	11.9 \pm 2.06
	After12 months	11.35 \pm 1.13	11.71 \pm 1.3
	P value	0.9537	0.6265
RA Factor(U/ml)	Before	120.94 \pm 93.99	174.72 \pm 120.05
	After12 months	127.06 \pm 91.79	111.82 \pm 79.63***
	P value	0.598	0.001
HAQ(0-3 range)	Before	1.4 \pm 0.46	1.17 \pm 0.52
	After12 months	1.1 \pm 0.54*	0.52 \pm 0.49***
	P value	0.0134	0.001
VAS(0-100mm)	Before	64.44 \pm 14.82	65.26 \pm 12.14
	After12 months	45.97 \pm 19.27***	16.67 \pm 12.43***
	P value	0.001	0.001
DAS-28 score (0-10 scale)	Before	7.06 \pm 1.07	6.89 \pm 1.05
	After12 months	5.86 \pm 1.7**	3.63 \pm 1.35***
	P value	0.006	0.001
ESR(mm/hr)	Before	44.9 \pm 29.1	47.41 \pm 25.39
	After12 months	36.6 \pm 17.0	35.92 \pm 18.19*
	P value	0.144	0.03

At the start of study none of the study subjects belonged to low disease activity group. Following the treatment it was observed that 11.1% of patients of control group were showing low disease activity where as the shift to low disease activity group in case of patients undertaking naturopathy and yoga was significantly increased to 51.4% (Table 2). Pain was measured on Visual Analogue Scale and it was found that after a period of 12 months high disease activity level patients in control group increased from 25% to 52.8 % whereas in Naturopathy and yoga group patients coming in high disease activity decreased from 25.6% to 0 % (Table 3).

Table 2. Percentage change in DAS-28 score in control and treatment (Naturopathy and yoga) before and after a period of 12months

DAS-28 score %	Assessment	control group	Treatment group
Base line	Moderate disease activity	5.6%	5.3%
	High disease activity	94.4%	94.7%
12 months	Low disease activity	11.1%	51.4%
	Moderate disease activity	16.7%	27%
	High disease activity	72.2%	21.6%

Table 3. Percentage change in VAS score in control and treatment (Naturopathy and yoga) before and after a period of 12 months

VAS %	Assessment	Control group	Treatment group
Base line	low disease activity	11.1%	2.6%
	Moderate disease activity	63.9%	71.8%
	High disease activity	25%	25.6%
12 months	low disease activity	0%	12.8%
	Moderate disease activity	47.2%	87.2%
	High disease activity	52.8%	0%

Grip strength was also measured as % of patients having low, moderate and high disease activity and it was observed that after 12 months of allopathic treatment in control group low disease activity patients increased from 13.9 % to 30.60% but second group which was given naturopathy, yoga along with allopathic treatment the increase was from 17.9% to 87.2% (Table 4). It was observed that after twelve months, patients with high disease activity in control group reduced from 38.9% to 30.6% and in treatment group reduced from 25.6% to 2.6%. Also in control group, number of patients in low disease activity increased from 13.9% to 30.6% whereas in treatment group the increase was from 15.4% to 87.2% (Table 5). At the start of the treatment 44.58% of the patients were in the normal/mild group which increased to 86.5% on completion of one year of treatment. In control group, patients coming in normal/mild group increased from 28.65% to 44.9 %. The decrease in number of patients in moderate/severe group was from 71.35% to 55.1% in control group but the decrease was from 86.5% to 13.5% in patients taking naturopathy and yoga therapy (Table 6).

Table 4. Percentage change in grip strength in control and treatment (Naturopathy and yoga) before and after a period of 12months

Grip strength	Assessment	control group	Treatment group
Base line	low disease activity	13.9%	17.9%
	Moderate disease activity	52.8%	64.1%
	High disease activity	33.3%	17.9%
12 months	low disease activity	30.60%	87.2%
	Moderate disease activity	44.4%	10.3%
	High disease activity	25%	2.6%

Table 5. Percentage change in finger squeeze test in control and treatment (Naturopathy and yoga) before and after a period of 12 months

Finger squeeze test	Assessment	control group	Treatment group
Base line	low disease activity	13.9%	15.4%
	Moderate disease activity	47.2%	59.0%
	High disease activity	38.9 %	25.6%
12 months	low disease activity	30.6%	87.2%
	Moderate disease activity	38.9%	10.3%
	High disease activity	30.6%	2.6%

Table 6. Percentage change in HAQ in control and treatment (Naturopathy and yoga) before and after a period of 12 months

HAQ	Assessment	control group	Treatment group
Base line	Normal/mild	28.65%	44.58%
	Moderate/severe	71.35%	55.42%
12 months	Normal/mild	44.9%	86.5%
	Moderate/severe	55.1%	13.5%

DISCUSSION

Drug treatments for RA have improved markedly in the last few years. Despite this, arthritis cannot be cured and even the best medical care may be of little help. There is a great need for additional activities that patients can do themselves so as to reduce pain and disability. In Rheumatoid Arthritis patients it is important to maintain a balance between sedentary life, which may reduce inflammation, and exercise, which may relieve stiffness and weakness. While traditional guidelines have restricted RA patients to only gentle exercise, research suggests that more intense exercise may not only be safe, but may actually produce greater muscle strength and overall functioning (Lineker *et al.*, 2001) and does not exacerbate pain or worsen the disease (Bearne *et al.*, 2002). The present study has shown that following Naturopathy and yoga practice, finger squeeze test and grip strength ESR and RA factor improved in treatment group. For the parameters like diastolic BP, HAQ, VAS, DAS-28, the improvement was observed in control group also although it was significantly more in patients taking naturopathy and yoga therapy. On analysis of percentage of patients in different disease activity group it was

observed that at the start of the study none of the patients, as observed in DAS-28 score, was in low disease activity in both the groups. But after 12 months of naturopathy and yoga therapy there was a significant rise in percentage of patients belonging to low activity. This resulted in remarkably less number of patients, of treatment group, in high disease activity group. Pain as measured by VAS showed that after treatment none of the patients was in high disease activity as compared to control group. In control group it was observed that the disease activity was increasing. After naturopathy and yoga therapy, improvement in grip strength and finger squeeze test was observed from the fact that more patients were having low disease activity as compared to control group. For the functional disability, as measured by HAQ, the improvement when compared in both the groups was found to be significant in naturopathy and yoga group as compared to control group. People with arthritis, often have decreased muscle strength, physical energy, and endurance in part due to tendency to be sedentary which results in more inactivity further leading to greater pain and disability.

The psychological benefits of yoga such as stress reduction, fewer depressive symptoms, improved coping and well-being contribute to greater overall health. An increase in inspiratory and expiratory pressures suggests that yoga training improves the strength of expiratory and as well as inspiratory muscles. Respiratory muscles are like skeletal muscles. Yogic techniques involve isometric contraction which is known to increase skeletal muscle strength and reduce stress and anxiety, improve autonomic functions by triggering neurohormonal mechanisms by the suppression of sympathetic activity (Sengupta 2012). Yoga may serve as a valuable adjunctive therapy for improving physical function, mental wellness, and overall quality of life among individuals with rheumatic disease (Matthew *et al.*, 2014). In their study Evans *et al* have reported that yoga for 6-10 week duration, carried out twice or thrice a week resulted in statistically significant improvement in pain, disability index, general health, mood (Evans *et al.*, 2013). A growing body of research evidence supports the belief that certain yoga techniques may improve physical and mental health through down-regulation of the hypothalamopituitary adrenal (HPA) axis and the sympathetic nervous system.

While the precise mechanism of action has not been determined, it has been hypothesized that some yoga exercises cause a shift toward parasympathetic nervous system dominance, possibly via direct vagal stimulation (Innes *et al.*, 2005; Chandra *et al.*, 2012). Massage is becoming a more widely-recognized way to cope with the pain and stiffness of arthritis. It is traditionally used for improving flexibility and circulation, easing pain, and reducing stress and anxiety. Research on massage for rheumatoid arthritis is scanty, but a few studies have shown that it may help relieve pain. Massage therapy has the ability to significantly affect systemic disorders because of the promotion of detoxification through vasodilatation to assist in the removal of toxins, which can cause pain responses; the improvement of overall circulation by encouraging blood and lymph flow; the activation of the parasympathetic nervous system division by lowering blood pressure, heart rate and respiration rate inducing relaxation and stress reduction (Prekumar 2004; O'Brien 2006).

This systemic rubbing with hands helped to nourish not only the parts acted upon but also the whole body by its known thermic and mechanical effects. It also increases the body metabolism. By measuring grip strength pre and post massage therapy treatment, including wringing, skin rolling, circular, and friction type strokes, a significant improvement in mobility and function was observed in comparison to the control group (Field *et al.*, 2007). Moreover, to increase formation and flow of synovial fluid in affected joints, treating the surrounding joint tissues with light friction and vibration and establishing a methodical treatment interval is suggested (Wine, 1995). Since RA is a systemic disease, it can also create blockage in lymph nodes proximal to affected joints and thereby contributing to discomfort and pain experienced by the patient. The aforementioned gentle circular friction techniques have been used to help increase the delivery of oxygen and nutrients and assist in the removal of waste products surrounding the affected joints (Osborn 2005). When the joint is in an acute inflammatory stage, massage is contraindicated.

However, when in remission, massage can effectively manage symptoms, prevent inflammation, and reduce joint damage (Lowe 2006). Therapeutic massage treatments, while able to achieve qualitative muscle release in an affected joint region, can also positively affect the physiological systems of a patient with RA and help to alleviate and prolong the deteriorating effects of the disease.(Robin 2007) Research showed that adults with rheumatoid arthritis may feel a decrease in pain, as well as greater grip strength and range of motion in wrists and large upper joints, after receiving regular moderate-pressure massages for a 4-week period (Field *et al.*, 2013). In Fomentation Therapy, the blood is stimulated and invigorated and white blood cells increase. When the heat is applied, the blood vessels dilate and with the cold they contract. This action causes the blood to surge back and forth, increasing the flow throughout the cavities, stimulating stagnant blood and lymph. This increases circulation to any organ or limb far more rapidly than normal circulation. When this happens, the healthy blood cells are concentrated in the activated area (Darrin 2013). The Increased blood flow delivers needed oxygen and nutrients, and removes cell wastes.

The warmth decreases muscle spasm, relaxes tense muscles, relieves pain, and can increase range of motion. Cold therapy produces vasoconstriction, which slows circulation thereby reducing inflammation, soreness, muscle spasm, pain and temporarily relieving joint pain caused by an arthritis flare. It has been found that cold compression therapy improves the control of pain and might thus lead to improvement in range of movement and shorter hospital stay (Kullenberg *et al.*, 2006). The present study of one year of naturopathy and yoga for RA was able to demonstrate statistically significant improvements in RA disease parameters like finger squeeze test and grip strength, ESR and RA factor ,HAQ, VAS, DAS-28 and diastolic BP. All the patients of group 2 given fomentation after massage and after yoga therapy had good relief in pain, swelling and stiffness of muscles after. Some patients in the treatment group were able to decrease or discontinue allopathic medications. Combinations of medications with naturopathy and yoga can provide important additional physical and psychological health benefits and help in the better management of chronic rheumatoid arthritis condition in

a scientific manner. Since studies of naturopathy and yoga have suggested potential benefits therefore the practice may have particularly strong appeal if it is capable of eliciting and maintaining patient adherence (Cramer *et al.*, 2013; Ebnezar *et al.*, 2012)

Conclusion

Naturopathy and yoga therapy can be used effectively as an adjunct therapy to allopathic medicine, for treatment of Rheumatoid Arthritis. The overall improvement in pain, disability index and general health of RA patients by naturopathy and yogic techniques used in the study may be because of improvement of mental health through down-regulation of the sympathetic nervous system and muscle strength through isometric contraction and detoxification by vasodilatation and improvement of blood circulation. This cost effective treatment helped in achieving a favourable systemic outcome and may offer the best hope for arresting arthritic condition. To inculcate naturopathy in daily life and make it a lifelong habit a lot of patience, perseverance and consistent efforts on part of the patient is required.

Acknowledgments

This project is supported by ICMR and we are thankful for the release of funds.

REFERENCES

- Osborn K. 2005. Chasing the pain away. (electronic version) *Massage & Bodywork*, 20(3):138-143.
- Lowe, W. 2006. Orthopedic Assessment in Massage Therapy. Sisters, Ore: Daviau Scott Publishers.
- Werner, R.A. 2005. *Massage Therapist's Guide to Pathology*. Baltimore, Lippincott, Williams & Wilkins.
- Feuerstein G. 1989. *Yoga: The Technology of Ecstasy*. Los Angeles, Jeremy P. Tarcher, pp 11-16
- American College of Rheumatology Subcommittee on Rheumatoid Arthritis, 2002. Guidelines for the management of rheumatoid arthritis. 2002 update. *Arthritis. Rheum.*, 46:328-346
- Kellogge, J.H. 1918. A manual of the physiological and therapeutic effects of hydrotherapeutic procedures, and the technique of their application in the treatment of disease. Rational hydrotherapy
- Gheranda Samhita:<http://www.yogavidya.com/Yoga/GherandaSamhita.pdf>
- Kumar, A., Malaviya, AN., Pandhi, A. and Singh, R. 2002. Validation of an Indian version of the Health Assessment Questionnaire in patients with rheumatoid arthritis: *Rheumatology*, 41: 1457-1459
- McCormack, H.M., Horne, DJ. and Sheather, S. 1988. Clinical applications of visual analogue scales: a critical review. *Psychol Med.*, 18:1007-19.
- Van der Heijde, D.M., van 't Hof, M.A., van Riel, P.L., Theunissen, L.A., Lubberts, E.W., van Leeuwen, M.A., van Rijswijk, M.H. and van de Putte, L.B. 1990. Judging disease activity in clinical practice in rheumatoid arthritis: first step in the development of a disease activity score. *Ann Rheum Dis.*, 49 (11):916-20
- Westergren, A. 1957. Diagnostic tests: the erythrocyte sedimentation rate range and limitations of the technique. *Triangle*, 3 (1): 20-5.
- Hermann, E., Vogt, P. and Müller, W. 1986. Rheumatoid factors of immunoglobulin classes IgA, IgG and IgM: Methods of determination and clinical value. *Schweizerische medizinische Wochenschrift*, 116 (38): 1290-7
- Lineker, S.C., Bell, M.J., Wilkins, A.L. and Badley E.M. 2001. Improvements following short term home based physical therapy are maintained at one year in people with moderate to severe rheumatoid arthritis. *J Rheumatol*, 28(1):165-168.
- Bearne, L.M., Scott, D.L. and Harley, M.V. 2002. Exercise can reverse quadriceps sensorimotor dysfunction that is associated with Rheumatoid Arthritis without exacerbating disease activity, *Rheumatology*, 41(2):157-166
- Sengupta, P. 2012. Jul Health Impacts of Yoga and Pranayama: A State-of-the-Art Review. *Int J Prev Med.*, 3(7): 444-458.
- Matthew C Sullivan, B.A., Elena Manning, BS. and Raveendhara R. Bannuru, 2014. Yoga for Rheumatic Conditions: Potential Physical, Cognitive and Affective Advantages *J Yoga Phys Ther.*, 4:2
- Evans, S., Moieni, M., Lung, K., Tsao, J., Sternlieb, B., Taylor, M. and Zeltzer, L. 2013. Impact of iyengar yoga on quality of life in young women with rheumatoid arthritis. *Clin J Pain*, 29(11):988-997.
- Innes, KE., Bourguignon, C. and Taylor, A.G. 2005. Risk indices associated with the insulin resistance syndrome, cardiovascular disease, and possible protection with yoga: A systematic review. *J Am Board Fam Pract.*, 18:491-519.
- Chandra, A.K., Sengupta, P., Goswami, H. and Sarkar, M. 2012. Excessive Dietary Calcium in the Disruption of Structural and Functional Status of Adult Male Reproductive System in Rat with Possible Mechanism. *Mol Cell Biochem.*, 364:181-91.
- Prekumar, K. 2004. *The Massage Connection: Anatomy and Physiology*. Baltimore: Lippincott, Williams & Wilkins
- O'Brien M. Therapy Database: Accessed Sept.1, 2006. Rheumatoid Arthritis www.altguide.com/therapydata/rheumatoid.html.
- Field, T., Diego, M., Hernandez-Reif, M. and Shea, J. 2007. Hand arthritis pain is reduced by massage therapy. *Journal of Bodywork and Movement Therapies*, 11:21-24.
- Wine, Z.K. Russian medical massage. 1995. arthritis. (electronic version) *Massage Magazine*, 57:90-92.
- Osborn, K. 2005. Chasing the pain away. (electronic version) *Massage & Bodywork*, 20(3):138-143.
- Lowe, W. 2006. Orthopedic Assessment in Massage Therapy. Sisters, Ore: Daviau Scott Publishers.
- Robin B. Anderson, 2007. Researching the Effects of Massage Therapy in Treating Rheumatoid Arthritis. *Massage Today*. December, 7(12)
- Field, T., Diego, M., Delgado, J., Garcia, D. and Funk, CG. 2013. Rheumatoid Arthritis in Upper Limbs Benefits from Moderate Pressure Massage Therapy. *Complementary Therapies in Clinical Practice*, 19(2):101-3.
- Darrin K. Poitras, 2013. Hot and cold towel therapy – fomentations <https://youtube/7pcmms3otts13>

- Kullenberg, B., Ylipää, S., Söderlund, K. and Resch, S. 2006. Postoperative cryotherapy after total knee arthroplasty: a prospective study of 86 patients. *J Arthroplasty*, 21(8): 1175–9.
- Cramer, H., Lauche, R., Langhorst, J. and Dobos, G. 2013. Yoga for rheumatic diseases: a systematic review. *Rheumatology*, 52(11): 2025-30.
- Ebnezar, J., Nagarathna, R., Yogitha, B. and Nagendra, H.R. 2012. Effects of an integrated approach of hatha yoga therapy on functional disability, pain, and flexibility in osteoarthritis of the knee joint: a randomized controlled study. *J Altern Complement Med.*, 18(5): 463-472.
