DOI: 10.14260/jemds/2015/263

ORIGINAL ARTICLE

ULTRASONOGRAPHIC ASSESSMENT OF COMMON CAROTID ARTERY ATHEROSCLEROSIS IN PATIENTS OF RHEUMATOID ARTHRITIS

Jayakumar S[1], Uday. G[2], Shivaraj[3]

HOW TO CITE THIS ARTICLE:
Jayakumar S, Uday. G, Shivaraj. "Ultrasonographic Assessment of Common Carotid Artery Atherosclerosis in Patients of Rheumatoid Arthritis". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 11, February 05; Page: 1841-1851, DOI: 10.14260/jemds/2015/263

ABSTRACT: BACKGROUND & OBJECTIVES: Patients with Rheumatoid Arthritis (R.A.) have a marked increase in Carotid Atherosclerosis independent of traditional risk factors like family history of myocardial infarction in first degree male relatives younger than 55 years of age or first degree female relatives younger than 65 years of age, smoking, hypertension (Defined as blood pressure of 140/90 mm hg or higher), diabetes mellitus and fasting serum cholesterol levels including age. Chronic inflammation and possibly disease severity and duration are atherogenic in Rheumatoid Arthritis patients. Preclinical disease may also be identified by using ultrasonography to determine carotid intimal-media thickness, an indirect measure of atherosclerosis. The common carotid artery Intima media thickness in Rheumatoid Arthritis patients is positively associated with disease duration, Early Rheumatoid Arthritis (Duration less or = 1 year) is associated with lesser Intima media thickness than was Rheumatoid Arthritis of longer duration. Increased carotid artery Intima media thickness and the presence of carotid plaque are associated with markers of systemic inflammation in patients with Rheumatoid Arthritis and in healthy subjects. **OBJECTIVE OF THE STUDY:** To determine preclinical atherosclerosis occurring prematurely in patients of Rheumatoid Arthritis by ultrasonograhic measurement Common Carotid Artery Intima media thickness and to evaluate the risk factors associated with arterial intima media thickness in patient of Rheumatoid Arthritis. **RESULTS:** In RA patients, common carotid artery IMT was significantly higher when compared to healthy controls (0.65 ± 0.06 v/s 0.57 ± 0.049) and was significantly associated with the duration of RA, swollen joint count and erosive changes on hand x-ray independently of other confounding variables. **CONCLUSION:** Patients with rheumatoid arthritis have a marked increase in carotid atherosclerosis independent of traditional risk factors, including age. Carotid ultrasonography is a simple and inexpensive way of identifying preclinical atherosclerosis in this highly vulnerable population. In addition to prospective management of traditional risk factors, there is a need for aggressive control of rheumatoid arthritis disease activity because chronic inflammation is a driving force for premature atherosclerosis.

KEYWORDS: CIMT-Carotid Intima Media Thickness, ESR- Erythrocyte sedimentation Rate.
RA- Rheumatoid Arthritis, RF - Rheumatoid Factor, SJC - Swollen Joint Count.
TJC - Tender Joint Count.

INTRODUCTION: Rheumatoid arthritis is a chronic systemic disease of unknown etiology. It is characterized by peripheral symmetrical polyarthritis. It has a progressive course with exacerbations and remissions being part of its natural history.[1] though being principally a disease of joints, several extra articular manifestations are also noted. The systemic manifestations include involvement of cardiac, pulmonary, hematological, ocular and neurological systems.

DOI: 10.14260/jemds/2015/263

The increased risk for cardiovascular disease in these patients is a consequence of atherosclerosis. The causes of accelerated atherosclerosis and increased coronary heart disease in RA patients are the subject of active research.

Development of Accelerated Atherogenesis in RA is due to systemic inflammation occurs as evidenced by increased levels of inflammatory markers in blood, and by the presence of extra articular manifestations of the disease.[2]

A study by Roman et al.[3] showed that patient with Rheumatoid Arthritis have a high prevalence of preclinical atherosclerosis independent of traditional risk factors suggesting that chronic inflammation and possibly the disease severity are atherosclerosis in this population.

A study by Jonsson et al.[4] have measured the extent of atherosclerosis in patient with Rheumatoid Arthritis, disease duration of considerable length and in age and sex matched individual concluded that accelerated atherosclerosis in patient with Rheumatoid Arthritis mainly related to lipid levels. A study done by Del Rincón et al.[2] conclude that increased carotid artery Intima-media thickness and the presence of plaque are associated with markers of systematic inflammation in patient with Rheumatoid Arthritis and in healthy subject. This observation is consistent with hypotheses that assign a role to systemic inflammation in atherosclerosis and may have implications regarding Rheumatoid Arthritis and other chronic inflammatory disease.

A study done by Park ET al.[5] concludes that Rheumatoid Arthritis patient has an Ultrasonography marker of early atherosclerosis consistent with an increased risk for atherosclerosis.

A study done by Kumeda et al.[6] conclude that the duration and severity of Rheumatoid Arthritis and deceased activities of daily living, but not corticosteroid treatment were independently associated with the increased arterial wall thickness.

The IMT corresponds to the width of the vessel intima and media, which consists of endothelium, connective tissue, and smooth muscle and is also the site of lipid deposition and plaque formation. The increased carotid IMT may precede the development of CV events by many years.
The determination of carotid IMT using ultrasound techniques provides useful and early information of atherosclerosis in subclinical stages of the disease in individuals at risk.

AIMS AND OBJECTIVES: To determine preclinical atherosclerosis occurring prematurely in patients of Rheumatoid Arthritis by ultrasonograhic measurement of Common Carotid Artery Intima media thickness. To evaluate the risk factors associated with arterial intima media thickness in patient of Rheumatoid Arthritis.

MATERIALS AND METHODS: The study was performed on patients attending the outpatient department of Victoria and Bowring hospitals. A total of 40 rheumatoid arthritis patients were enrolled and were compared with 20 age and sex matched control subjects. Total duration of the study was 2 years.

INCLUSION CRITERIA: After clinical evaluation and laboratory investigations, those patients satisfying the modified American Rheumatology Association criteria (1987) were included in the study. Age and sex matched controls were selected from medical OPD who came for routine health checkup or had nonspecific complaints, after taking care to exclude those suffering from hypertension, diabetes mellitus.

DOI: 10.14260/jemds/2015/263

EXCLUSION CRITERIA: Patients younger than 18 Years and >55 Years, Serum Creatinine level >3 mg/dl, current pregnancy or recent delivery (with in past 3 month). Patients who are Hypertensive, Diabetes mellitus, on hormone replacement therapy and Corticosteroid treatment and Smokers were excluded from the study.

All patients were evaluated with detailed history. Duration of RA, presence and duration of morning stiffness, joint pain (Onset, distribution, duration), and history of extra articular manifestation of RA were documented. Treatment history was also documented. A systemic examination of all joints was done for the features of activity, tender and swollen joint count estimation was done.

A simplified 28 joint articular index as described by Fuch's et al[7] was used to assess disease activity. Twenty-eight joints included 10 proximal interphalangeal joints of the fingers, 10 metacarpophalangeal joints, and the wrist, elbow, shoulder and the knee joints bilaterally.

The following investigations were done with special emphasis; Erythrocyte sedimentation rate was obtained by Westegren method. Quantitative assay of Rheumatoid Factor (Ig G) was performed using a latex fixation Lab kit. Quantitative assay of C-reactive protein was performed using a latex agglutination kit.

Carotid ultrasonography (Carotid Doppler): The intima-media thickness (IMT) of extra cranial carotid arteries determined by B-mode ultrasound is a measurable index of the presence of atherosclerosis. Carotid intima thickness, determined by ultra-sonogram, was a direct measure and proxy for generalized atherosclerosis and a surrogate for coronary atherosclerosis.

One technician performed a duplex scan of the carotid arteries in all patients and controls, following a standardized vascular protocol developed for the Multi-Ethnic Study of Atherosclerosis, for which she was certified (18). An ATL HDI-3000 high-resolution imaging machine with an L7-4 transducer (Philips Medical Systems, Bothell, WA) was used. The technician acquired 4 standardized B-mode images and a Doppler flow measurement from the right and left sides of the neck. The first image was of the distal common carotid artery, and the 3 others were centered on the site of maximum near and far wall thickening in the proximal internal carotid artery or carotid bulb. Results were recorded on Super VHS tape, the recorded images were digitized at 30 frames per second, and fluctuations of the arterial diameter with the cardiac cycle were observed. IMT measurements were obtained at each of the near and far walls of the right and left common carotid arteries, and anterior oblique, lateral, and posterior oblique views of the right and left internal carotid artery, for a total of 16 views per person.

Results were summarized into 2 variables, 1 for the common carotid artery and 1 for the internal carotid artery. The maximal IMT of each of these was obtained by averaging the maximal measurements of the near and far walls and the right and left sides. Then a composite maximal IMT was calculated by averaging the common and internal carotid measurements. Results were expressed in millimeters. The images were also read for the presence of vessel plaque, identified as a discrete projection from the wall into the vessel lumen.

Radiographic assessment: X-ray of both hands was taken in all patients to evaluate for rheumatoid activity, deformities and erosions. These were documented on the Steinbrocker's radiological assessment of the hands scale.

DOI: 10.14260/jemds/2015/263

The Steinbrocker's criteria.[8] for staging hand radiographs were defined as follows:

1. No destructive changes, but periarticular osteoporosis may be present.
2. Osteoporosis and slight cartilage and/or subchondral bone destruction.
3. Osteoporosis and cartilage and/or bone destruction.
4. Stage 3 plus fibrous or bony ankylosis

Method of Statistical Analysis: The following methods of statistical analysis have been used in this study. a) Analysis of Variance, b) Chi-square test, c) student 't' test.

Data was entered in Microsoft excel and analyzed using SPSS (Statistical Package for Social Science, Ver.10.0.5) package.

RESULTS: The study group included 31 females and 9 males (M: F ratio 1: 3.4). Mean age in years of rheumatoid arthritis patients was 44.72 ± 7.67 years. The oldest patient was 55 years and the youngest was 28 years. In the control group the mean age was found to be 43.15 with standard deviation of 8.11 years.

The mean duration of disease was 39.3 ± 31.4 months. Morning stiffness of more than 1 hour was present in 31 patients. Mean duration of morning stiffness being 8.3 ± 6.79 months. Duration of joint swelling was 19.85 ± 15.42 months. Joint deformities was present in 23 (57.5%) in form of swan neck deformity,

The mean tender joint count was 14.4 ± 6.156 with the range being 0 to 28, and the mean swollen joint count was 9.6 ± 5.728 with range of 0 to 18. Rheumatoid nodule was present in 5 RA patients (12.5%).

Mean height in patients was 159.88 cm with a range of 153 to 174 cm. Mean weight in patients was 57.12 kg with a range of 49 to 74 kg. Mean BMI in RA patients was 22.4 ± 1.33 and mean BMI in controls being 23.3 ± 1.22.

The mean ESR in the study group was 50.78 and ranged from 8 to 85mm/hr. Mean total white blood count was 8543.00 with a standard deviation of 2182.417 (range: 4000 to 14100 cells/cumm).

Pallor was present in 10 patients (25%), the hemoglobin levels ranged from 6 to 15.2 gm% with a mean of 11.04 gm%. 30 patients (75%) were found to be rheumatoid factor (RF) positive. C-reactive protein was present in all patients of rheumatoid arthritis.

Radiological assessment of the hand X-rays based on Steinbrocker's classification. None of the patients belong to class 4. Baseline characteristics of rheumatoid arthritis patients (Table 1).

Carotid intima media thickness in rheumatoid arthritis patients (Table 2) was 0.65± 0.06and in control subjects was 0.57±0.049 which was statistically significant ('p' value 0.000).

Carotid intima media thickness was higher in age group 41-55 yrs. when compared with age group of 26-30, 31-35 and 36-40 year age group. CIMT was higher in patients with joint pain duration of 1-5 years when compared with less than 1 yrs. and more than 5yr (Table 3)

There was no statistical significant difference in carotid intima media thickness between the duration of morning stiffness less than 1 hr and more than 1 hr in the study group.

There was no correlation between the duration of swelling of joints and carotid intima media thickness. The onset of disease, distribution of joint pain and site of onset of joint pain did not have significant correlation to carotid intima media thickness.

DOI: 10.14260/jemds/2015/263

There was no statistical difference in carotid intima media thickness in patients with joint deformity and without joint deformity.

There was no statistical significance correlation between tender joint count and carotid intima media thickness. Swollen joint count had a positive correlation to CIMT (Table 4), the mean swollen joint count was 9.6±5.728 with range of 0 to 18 There was no statistical difference in carotid intima media thickness in patients with BMI <24.9 and >24.9 The presence of rheumatoid factor positivity and rheumatoid nodules had no significant correlation with carotid intima media thickness. There was no statistical significance in CIMT between the study group with ESR < 30 mm/hr and >30mm/hr. ESR had a negative correlation to carotid intima media thickness.

Patients with Steinbrocker's class 3 radiological changes(Table 5a & 5b) had higher carotid intima media thickness when compared to class 1 and 2 and it was statistically significant when compared to class 1 and 2('p' value 0.000).

There was no difference in common carotid artery intima media thickness in RA patients who were taking methotrexate when compared to patients not on methotrexate ('p' value 0.324).

To conclude Carotid intima media thickness showed positive correlation to disease duration, swollen joint count, Steinbrocker's radiological assessment of the hands scale and negative correlation to ESR.

DISCUSSION: Chronic joint inflammation characterizes rheumatoid arthritis (RA). Systemic inflammation occurs as well, as evidenced by elevated levels of inflammation markers in the blood, and by extraarticular involvement. Patients with RA experience cardiovascular (CV) events more often than expected, and their mortality attributable to CV causes is increased. The mechanism of the increased CV event rate in RA is not well understood. In healthy subjects, there is an association between inflammation markers and CV disease. This raises the possibility that the severe systemic inflammation seen in RA may bring about its high CV mortality by causing accelerated atherosclerosis.[2]

Age and sex distribution: Mean age in years of RA patients in this study was 44.72 ± 7.67 years, with male to female ratio being 1: 3.4 (9:31). In the present study maximum number of patients 27(67.5%) were in age group of 41-55 years and mean CIMT 0.6710 mm was high when compared to age group between 26-40 years with mean CIMT being 0.6041mm.

In a study done by Pahor et al.[9] mean age was 42.04 ± 5.53 years, study group included only females of premenopausal group. With multiple regression analysis there was a relationship between IMT and age (P = 0.004), the mean age in this study was similar to our study.

In a study done by kumeda ET al[6] mean age was 55.0 ± 0.7 years comprising of 16 male and 122 females (1:7.6) out of 138 RA patients. With multiple regression analyses of factors associated with common carotid and femoral artery IMT in the entire group of study subjects, which included age, sex, smoking index, systolic blood pressure, total cholesterol, and triglycerides as independent variables, showed that only age was found to be significantly associated with common carotid artery IMT.

Joint pain: in this study the mean duration of joint pain was 39.3 ± 31.45 months. Patients with joint pain duration of 1-5 years had a statistically significant higher CIMT when compared to patients with joint pain duration of less than 1 year and more than 5 year.

DOI: 10.14260/jemds/2015/263

In a study done by Park ET al.[5] mean duration of disease was 49.9 ± 45.0 months. Early RA (Duration <1 year since diagnosis) was associated with a significantly lesser mean ± SD IMT of the right and left CCAs than was RA of longer duration (0.72 ±0.03 mm versus 0.78 ± 0.01 mm; P < 0.04). In a study done by Pahor ET al.[9] mean duration of disease was 114.64±75.08 months. Both the above studies had mean duration of disease higher when compared to our study group. In a study done by Kumeda et al.[6] showed that duration of RA was significantly associated with CIMT independently of age, sex, smoking index, blood pressure, total cholesterol and triglycerides.

Tender joint and swollen joint count: The mean tender joint count was 14.4 ± 6.156 with the range being 0 to 28; there was no statistically significance correlation between tender joint count and carotid intima media thickness.

The mean swollen joint count was 9.6 ± 5.728 with range of 0 to 18. There was statistically significant positive correlation between swollen joint count and carotid intima media thickness.
A study done by Park et al[5] found mean tender joint count of 7 ± 9.4 and the mean swollen joint count of 2.8 ± 4.4.

Joint deformities: Joint deformities was present in 23 (57.5%) and there was no statistical difference in carotid intima media thickness in patients with joint deformity and without joint deformity. In a study done by Park ET al[5] deformed joint count was 1.4 ± 3.0 and it was a potential predictor of increased CIMT with a 'p' value less than 0.2 by Spearman's correlation test.

ESR: In the study group mean ESR was 50.78±19.32mm/hr. There was no statistical significance in carotid intima media thickness between the study group with ESR < 30 mm/hr and >30mm/hr. ESR had a negative correlation to carotid intima media thickness. The mean ESR in a study done by Park et al[5] was 41.1 ± 29.3 and cumulative ESR (mm/hour x months) was 31,706 ± 32,677. It was a potential predictor of increased CIMT with 'p' value less than 0.2 by Spearman's correlation test.

In a study done by Del Rincon et al[2] mean ESR was 41 ± 26mm/hr. The Pearson correlation coefficient between the carotid artery IMT and ESR categories was 0.16 (P = 0.004). A significant linear trend was found for increasing carotid artery IMT as the level of inflammation markers increased.

In a study done by Kumeda ET al[6] showed that none of the inflammatory markers including ESR had an independent association with carotid intima media thickness.

C-reactive protein: In the present study C-reactive protein was present in all patients of rheumatoid arthritis. In a study done by Kumeda ET al[6] C-reactive protein level (mg/dl) was 1.75 ± 2.47 and this inflammatory marker did not show an independent association with CIMT. In study done by Del Rincon ET al[2] C-reactive protein level was found to be 12.3±15.7. The Pearson correlation coefficient between the carotid artery IMT and the CRP categories was 0.13 (P = 0.02). A significant linear trend was found for increasing carotid artery IMT as the level of inflammation markers increased.

RA Factor: 30 patients (75%) were found to be rheumatoid factor (RF) positive. The presence of rheumatoid factor positivity had no significant correlation with carotid intima media thickness. In a study done by Pahor ET al.[9] RA Factor was positive in 72.9% patients and in a study done by Del

DOI: 10.14260/jemds/2015/263

Rincon et al.[3] RA Factor was positive in 77% patients which is comparable to our study. In a study done by Kumeda ET al.[6] rheumatoid factor did not show an independent association with carotid intima media thickness.

Radiological changes: Patients with Steinbrocker's class 3 radiological changes had higher carotid intima media thickness when compared to class 1 and 2 and it was statistically significant when compared to class 1 and 2('p' value 0.000) In a study done by Kumeda ET al.[6] radiographs of the hands were obtained and the degree of RA progression was assessed by Larsen scoring of the metacarpophalangeal (MCP) joints on radiographs of the hands. There was a significant positive association between the Larsen score for the MCP joints and the CIMT by multiple regression analysis. As bone destruction progressed in RA patients the arterial wall changes also progressed.

Carotid intima media thickness: In the present study, Carotid intima media thickness was significantly higher in rheumatoid arthritis patients than in control subjects (0.65 ± 0.06 v/s 0.57 ± 0.049) which was statistically significant ('p' value 0.000). Kumeda et al[6] showed Common carotid and femoral artery IMTs were significantly higher ($P < 0.05$) in RA patients (Mean ± SD 0.641 ±0.127 and 0.632 ± 0.125 mm, respectively) compared with controls (0.576 ± 0.115 and 0.593 ± 0.141 mm, respectively). A study done by Park et al[5] the mean ± SD IMT of the left and right common carotid arteries in RA patients was significantly greater than that in controls (0.77 ± 0.09 mm versus 0.68 ± 0.14 mm; $P < 0.001$). A study done by Pahor et al[9] the IMT values were higher in RA patients (0.59 mm vs. 0.47 mm, $P < 0.0001$) and they had more plaques ($P = 0.023$).

Treatment: In the present study 25 patients were on treatment with methotrexate and the differences in common carotid artery IMT did not reach statistical significance between the RA patients who were taking MTX 0.64 ± 0.07 and patients who were not on MTX 0.66 ± 0.05 ('p' value 0.324).

In a study by Kumeda ET al[6] 16 patients were on MTX out of 138 patients in study group and in a study done by Park et al[5] 46 patients were on MTX out of 53 patients in study group. In both the studies there was no statistical significance between the RA patients who were taking MTX and patients without MTX.

In the present study, we demonstrated that the IMT of the common carotid arteries was significantly higher in RA patients than in healthy controls. The healthy subjects were comparable with the RA patients with regard to risk factors for atherosclerosis, including age, sex, smoking, blood pressure, and serum lipid levels.

Furthermore, in RA patients, common carotid artery IMT was significantly associated with the duration of RA, swollen joint count and erosive changes on hand x-ray independently of other confounding variables. These results therefore show that RA itself is an independent factor associated with increased arterial wall thickness.

CONCLUSION: Rheumatoid arthritis patients exhibited greater intima media thickness of common carotid artery compared to age and sex matched healthy control subjects. The mean duration of disease was found to be 39.3 month. Patients with duration of disease less than 1 year had lesser CIMT compared to patients with duration of disease more than 1 year. CIMT was significantly associated with duration of RA, swollen joint count and erosive changes on hand x-ray independently

of other confounding variables. However there was no significant correlation between CIMT and tender joint count, RF positivity, joint deformity and rheumatoid nodules. CIMT had a negative correlation to ESR.

SUMMARY: Patients with rheumatoid arthritis have a marked increase in carotid atherosclerosis independent of traditional risk factors, including age. Carotid ultrasonography is a simple and inexpensive way of identifying preclinical atherosclerosis in this highly vulnerable population. In addition to prospective management of traditional risk factors, there is a need for aggressive control of rheumatoid arthritis disease activity because chronic inflammation is a driving force for premature atherosclerosis.

BIBLIOGRAPHY:

1. Akil M, Amos RS. ABC of Rheumatology: Rheumatoid arthritis –I: Clinical Features and diagnosis. BMJ 1995; 310: 587-590.
2. Del Rincon I, Williams K, Stern MP, Freeman GL, O'Leary DH, Escalante A. Association between carotid atherosclerosis and markers of inflammation in rheumatoid arthritis patients and healthy subjects. Arthritis Rheum 2003; 48:1833-40.
3. Mary J. Roman, MD; Elfi Moeller, AB; Adrienne Davis, AB; Stephen A. Paget, MD; Mary K. Crow, MD; et al. preclinical carotid atherosclerosis in patients with Rheumatoid Arthritis. Annals of Internal Medicine. 21 Feb 2006; 144-4:249-256.
4. Wallberg-Jonsson S, Johansson H, Ohman ML, Rantapaa-Dahlqvist S. Extent of inflammation predicts cardiovascular disease and overall mortality in seropositive rheumatoid arthritis. A retrospective cohort study from disease onset. J Rheumatol 1999; 26:2562-71.
5. Park YB, Ahn CW, Choi HK, et al. Atherosclerosis in rheumatoid arthritis: morphologic evidence obtained by carotid ultrasound. Arthritis Rheum 2002; 46:1714-9.
6. Kumeda Y, Inaba M, Goto H, et al. Increased thickness of the arterial intima-media detected by ultrasonography in patients with rheumatoid arthritis. Arthritis Rheum 2002; 46:1489-97.
7. Fuchs HA, Brooks RH, Callanhan LF, Pincus T. A simplified 28 point articular index in rheumatoid arthritis. Arthitis Rheum 1989; 32:531-7.
8. Steinbrocker O, Traeger C H, Batterman R C. Therapeutic criteria in rheumatoid arthritis. JAMA 1949; 140:659-662.
9. Pahor A, Hojs R, Gorenjak M, Rozman B. Accelerated atherosclerosis in pre-menopausal female patients with rheumatoid arthritis. Rheumatol Int (2006) 27:119-123.

DOI: 10.14260/jemds/2015/263

characteristic	Patients(n= 40)	Controls (n=20)
Sex ratio (M:F)	1:3.4	1:2.3
Mean Age (year)	44.72±7.67	43.15±8.11
Duration of disease(months)	39.3±31.45	-
Morning stiffness (>1hr)	31/40 (77.5%)	-
BMI	22.47±1.332	22.6±1.22
ESR	50.78±19.32	-
TJC	14.4	-
SJC	9.6	-
Deformities	24/40 (60%)	-
Rheumatoid nodules	5/40 (12.5%)	-
R A Factor - Positive	30/40 (75%)	-
C-reactive protein	Positive	
Radiological changes	Class 1 15 Class 4 10 Class 3 15 Class 4 0	-
Treatment -Methotrexate	25/40 (62.5%)	-
Mean carotid intima media	0.6552±0.069mm	0.5730±0.049mm

Table 1: Baseline characteristics of rheumatoid arthritis patients

	N	Mean Carotid doppler (IMT)	Std. Deviation	Minimum	Maximum	't' value	'p' value
Case	40	.6552	.06906	0.50	0.80	22.549	.000
Control	20	.5730	.04921	0.50	0.65		

Table 2: Comparision of Carotid intima media thickness

Joint Pain Duration	N	Mean Carotid Intima Media Thickness (CIMT)	Std. Deviation	Minimum	Maximum	'F' value	'p' value
<1 yr	11	.6064	.06120	.50	.70	5.009	.012
1-5 yrs	18	.6822	.05375	.60	.80		
>5 yrs	11	.6600	.07733	.50	.80		
Total	40	.6552	.06906	.50	.80		

Table 3: Comparison of duration of joint pain with MCIT

DOI: 10.14260/jemds/2015/263

Swollen Joint Count (SJC)		SJC	Carotid doppler (CIMT)
SJC	Pearson Correlation	1.000	.522**
	'p' value		.001
	N	40.000	40
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 4: Correlations of swollen joint count with CIMT

ST X-ray	N	Mean Carotid doppler (CIMT)	Std. Deviation	Minimum	Maximum	'F' value	'p' value
Class I	15	.5953	.05423	.50	.66	17.348	.000
Class II	10	.6760	.03340	.60	.70		
Class III	15	.7013	.05655	.65	.80		

Table 5a: Comparison of Steinbrocker's classification with CIMT

(I) ST X-ray	(J) ST X-ray	Mean Difference (I-J)	Std. Error	Sig.
Class I	Class II	-.08067*	.02079	.000
	Class III	-.10600*	.01860	.000
Class II	Class III	-.02533	.02079	.231

Table 5b: Statistical significance between Steinbrocker's classification group

Patients Characteristic	Our study	Kumeda et al[6], June 2002	Park et al[5], July 2002	A. Pahor et al[9], 2006	Del Rinco´n et al[2], 2003
Sample size	40	138	53	70	204
Sex ratio (M:F)	1:3.4	16:122	All females	All females	23:181
Mean Age (year)	44.72±7.67	55.0±10.7	55.0±3.2	42.04±5.53	59.6(40–83)
Duration of disease(months)	39.3±31.45		49.9±45.0	114.64 ±75.08	
Morning stiffness (>1hr)	31/40 (77.5%)		45.4±69.4 min		
BMI	22.47±1.332	21.6±2.8	23.5±3.5		29.6 ± 6.8
ESR	50.78±19.32		41.1±29.3		41 ±26
TJC	14.4		7.0±9.4		
SJC	9.6		2.8±4.4		

DOI: 10.14260/jemds/2015/263

Deformities	24/40 (60%)				
Rheumatoid nodules	5/40 (12.5%)				
R A Factor - Positive	30/40 (75%)		48(91)	72.9%	157 (77%)
C-reactive protein	positive		1.75±2.47		12.3 ±15.7
Radiological changes	19/40 (47.5%)				
Treatment - Methotrexate	25/40 (62.5%)	16	46(87)		
CIMT(mm)	0.65± 0.06	0.641±0.127	0.77±0.09	0.586 ± 0.097	1.034± 0.434

Table 6: Comparison with other studies

AUTHORS:

1. Jayakumar. S
2. Uday. G
3. Shivaraj

PARTICULARS OF CONTRIBUTORS:

1. Senior Resident, Department of General Medicine, ESCI MC & PGIMSR.
2. Senior Resident, Department of General Medicine, ESCI MC & PGIMSR.
3. Junior Resident, Department of General Medicine, ESCI MC & PGIMSR.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Uday G,
#592, 10th C Cross, 2nd Stage,
Mahalakshmi Puram P.O.,
West of Chord Road,
Bangalore-560086.
E-mail: druday_81@yahoo.co.in

Date of Submission: 13/01/2015.
Date of Peer Review: 14/01/2015.
Date of Acceptance: 27/01/2015.
Date of Publishing: 04/02/2015.