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EFFECT OF TWO AYURVEDIC DRUGS ON BODY WEIGHT AND SYNOVIAL FLUID VOLUME IN OSTEOARTHRITIS INDUCED RATS

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ABSTRACT

Introduction: Cissus quadrangularis and Zingiber officinale rocs are the species widely used in folk medicine to treat osteoarthritis and hasten the fracture healing process. Present study to evaluate the body weight and synovial fluid volume in osteoarthritis conditions. **Method:** To determine the body weight and synovial fluid volume during the treatment of tested drugs in osteoarthritis induced rats. The body weight and synovial fluid volume of each rat was measured every week after 14 days of inducing osteoarthritis. The knee swelling was calculated based on synovial fluid volume by using vernier calliper scale. The tested groups are: Group-I-Control, Group II-Dexamethasone, Group III-Cissus quadrangularis linn-450 mg/kg; Group-IV-Zingiber officinale rocs-450 mg/kg; Group-V- Cissus quadrangularis linn+Zzingiber officinale rocs-450mg/kg. **Results:** All tested drugs were significantly reduced body weight and synovial fluid volume as compared to control group as follows: Group-III; Cissus quadrangularis linn (166.83± 0.941to145.16±0.941)(3.04±0.12to1.87±0.25*),Group-IV; Zingiber officinale rocs (165.33±0.160 to 146.5 ± 0.871)(3.02±0.09 to1.86 ± 0.16*), Group-V Cissus quadrangularis linn+ Zingiber officinale rocs (166.83 ± 0.941+145.16 ± 0.941)(3.05 ± 0.14 to1.85 ± 0.07*). **Conclusion:** All tested group are showed significant reduction in body weight and synovial fluid volume. Significant reduction of synovial fluid volume in combination treatment of cissus quadrangularis linn+ zingiber officinale rocs where compared to indusial drug which is almost equal to that of standard drug.

KEYWORDS: Cissusquadrangularis Linn, Zingiberofficinale rocs,Body weight, Synovial fluid.

INTRODUCTION

Inflammation is a physiological response to injuries such as trauma, infection or immune reactions.[1] it occurs in various diseases like allergies to kidney failure, stroke, and rheumatoid arthritis, and many are age related factors.[2] Pro-inflammatory cytokines induce the production of iNOS in number of cells, including fibroblasts either a toxic or a protective effect.[3,4] Nitric oxide is the important signalling molecule, produced as a part of the inflammatory response from activated cells and macrophages.[5] The excessive production of Nitric oxide induced by inflammatory cytokines in arthritic joints has been associated to the initiation of apoptosis in chondrocytes. Thus, compounds may have beneficial therapeutic effects in arthritis by blocking cartilage degradation.[6] Osteoarthritis is involved in both systemic factors (e.g. age, sex, genes) and local factors (e.g. muscle weakness, joint deformity) influence the risk of individual joints developing the disease. The specific aetiological factors are unknown, but may include mechanical overloading, failure of the chondrocyte-controlled internal remodelling system and extra cartilaginous factors such as synovial or vascular changes.[7] In rural region of developing countries people are at risk of higher physical activities even though they are less prevalent to obesity. Due to limited access towards musculoskeletal surgeries most people lives with severe joint pains in older years.[8] Its symptoms include joint pain, joint stiffness, tenderness, swelling, crepitus and a limited range of motion. Determination of risk factors particularly in the weight-bearing joints and their modification may reduce the risk of ostioortharitis.[9] Present study to evaluate the body weight and synovial fluid volume in osteoarthritis conditions.

METHODOLOGY

The study was carried out in Department of Dravyaguna, S.V Ayurvedic Medical College, Tirupathi. Study was conducted after obtaining the institutional ethical committee approval from 2015 to 2016. The total experimental groups were divided in to 5 (I, II, III, IV, V) with treated in the interval of 28th days.

Induction of osteoarthritis in rats

Osteoarthritis was induced by giving a single intra-articular injection of 1 mg monosodium iodoacetate (MIA) (crystal powder M = 185.96 g/mol). MIA was dissolved in physiologic saline and administered in a volume of 50 µL using a 30-gauge needle through the intra patellar ligament of the left knee. After the MIA injection a substantial inflammation of synovial joints was observed in this model. The general health of the animals was monitored. No signs of distress were seen.

Animal Experimental Groups

1. The group I - Normal saline (control) orally.
2. The group II – Treatment of Dexamethasone in a dose of 8 ml/kg orally (Standard).
3. The group III – Treatment of *cissus quadrangularis* linn in a dose of 450 mg/kg orally.
4. The group IV – Treatment of *zingiber officinale* rosc. in a dose of 450 mg/kg orally.
5. The group V – Treatment of both cissus *quadrangularis* linn and *zingiber officinale* rosc. in a dose of 450 mg/kg orally.

Study of inflammation

Measurement of the joint observed after inducing osteoarthritis with MIA and the standard and trial drugs were started after inflammation was total from 1st, 7th, 14th, 21st, and 28th day by calculating the swelling of the joint based on synovial fluid volume with Vernier Calliper scale. The formula used for calculation of synovial fluid; Synovial fluid volume (mm^3) = $(a \times b^2)/2$; where, a: Length in mm and, b: Width in mm.

Body weight

All animals were weighed on 1st, 7th, 14th, 21st, and 28th day of the study period to study change in body mass. (Grams).

Statistical analysis

The statistical package Graph Pad Prism 3.1 version was used to analyse all results. Values are expressed as mean ± SEM. One way ANOVA followed by post hoc Dunnett's test was used for analysis of data and for comparisons between treated and control groups; $p < 0.05$ was considered significant.

RESULTS

Table 1: Effect of drugs on body weights (weekly) in osteoarthritis induced rats (Grams).

Day	Group I	Group II	Group III	Group IV	Group V
Day 1	167.83± 0.82	168.16±1.858	166.66 ± 1.944	165.33±0.160	166.83 ± 0.941
Day 7	171.16± 0.9	172 ± 1.366	162.16 ± 2.545	164.5 ± 1.168	162.8 ± 1.229
Day 14	175.6 ± 0.65	176.83±1.994	158.66 ± 2.204	160.66±2.141	158 ± 1.147
Day 21	180.3 ± 0.733	181.5 ± 2.271	153.5 ± 1.168	152.66±1.944	150.5 ± 1.429
Day 28	183.3 ± 1.160	187.6 ± 1.966	147.8 ± 0.483	146.5 ± 0.871	145.16 ± 0.941

The standard drug group and tested drug groups were fed with ad libitum throughout the study period. The weight of each rat was measured every week after 14 days of inducing osteoarthritis. The rate of increase in body weight was noticed in group-I (control) and Group-II (standard), whereas the weight reduced in remaining all the three groups. On comparing with the groups-III (166.83 ± 0.941 to 145.16 ± 0.941). Shows more significant decrease in body weight. Remaining Group-IV and V (147.8 ± 0.483 and 146.5 ± 0.871) showed significant reduction in the body weight.(Table.1).

Table 2: Effect of drugs on synovial fluid volume based on knee swelling (mm).

Day	Group I	Group II	Group III	Group IV	Group V
Day 1	1.85 ± 0.11	3.01 ± 0.10	3.04 ± 0.12	3.02 ± 0.09	3.05 ± 0.14
Day 7	1.84 ± 0.05	2.96 ± 0.13	2.85 ± 0.09	2.78 ± 0.27	2.96 ± 0.24
Day 14	1.85 ± 0.09	2.65 ± 0.15	2.42 ± 0.13	2.38 ± 0.2	2.45 ± 0.12
Day 21	1.84± 0.16	1.98 ± 0.12*	2.0 ± 0.05*	1.98 ± 0.25*	2.01 ± 0.24*
Day 28	1.85 ± 0.28	1.84 ± 0.15*	1.87 ± 0.25*	1.86 ± 0.16*	1.85 ± 0.07*

Results are presented as mean ± SEM, (n=6), *p<0.05 dunnett's test as compared to control.

To study the effect of anti-inflammatory activity of standard drug (Group-II) and tested drug (Groups-III, IV and V). All the tested groups except normal saline (Group-I) were induced osteoarthritis by MIA. The knee swelling was calculated based on synovial fluid volume by using vernier calliper scale. The standard drug (Group-II) showed better anti-inflammatory activity when compared to the tested drugs, the mean volume reduced from 3.01± 0.10 to 1.84 ± 0.15*; Group-III was reduced from 3.04 ± 0.12 to 1.87 ± 0.25*; Group-IV and

V were swelling reduced from 3.02 ± 0.09 to 1.86 ± 0.16*and 3.05 ± 0.14 to 1.85 ± 0.07* showed statistically significant reduction in swelling. (Table-2).

DISCUSSION

Osteoarthritis conditions are prevalent and their impact is pervasive. They are the most common cause of severe long term pain and physical disability, and they affect millions of people around the world. They significantly affect the psychosocial status of affected people as well as their families and carers.[10] The prevalence of osteoarthritis high indefinitely with age, because the condition is not reversible. This osteoarthritis will be men are affected more often than women among those aged 55 years.[11] Diagnosed cases are treated with exercise and some medication, however in extreme cases, knee arthroplasty surgeries are performed. Musculoskeletal surgeries are among the top surgical needs of population currently.[12] Regional differences contribute much among the pattern of osteoarthritis In Asia and Africa; Osteoarthritis of hip seems to be less common than in western countries.[13] Also gender differences are observed with higher prevalence in females during menopausal stage.[14] Asian women with average menopausal age of 46.3 years are at early risk of OA than that of western women with 51 years age.[15] Apart from ageing and sex other etiological factors of OA described as nature of work, physical activities, community lifestyle and obesity.[16] The present study to estimation of body weight and synovial fluid volume after treatment of two ayurvedic drugs and anti-inflammatory activity of the standard group and the tested drug groups were calculated based on synovial fluid volume by using vernier calliper scale. All tested group are showed significant reduction in body weight and synovial fluid volume. Reduction of synovial fluid volume in the combination treatment of cissus *quadrangularis* linn+ *zingiber officinale* rocs where compared to indusial drug which is almost equal to that of standard drug.

CONCLUSION

To conclude the above results,

1. All tested drugs (Group-III, IV and V) are showed significant reduction in body weight when compared to control and standard drug.
2. Significant anti- inflammatory (decreased synovial fluid volume) activity was observed in combination treatment of cissus *quadrangularis* linn+ *zingiber officinale* rocs when compared to the indusial drug. Anti-inflammatory effect is almost equal the standard drug dexamethasone.

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