

Rheumatoid Arthritis Medical Management!Allopathic System vs Indian System of Medicine in India

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Abstract

Rheumatoid Arthritis (RA), according to Allopathic medicine, and Aamavata according to Ayurveda, has an etiological and clinical relationship. The Ayurvedic approach describes Aamavata as a disease complex of which RA is a part. A comparative study of the pathophysiology of this disease by both systems reveals that modern medicine has investigated the mechanism of inflammation and has developed an offense strategy to control it. Ayurveda follows a defense strategy, and it focuses its search on the etiological process, where disequilibrium at a higher level of physiology affects the gastrointestinal tract, causing an immune response that results in inflammation.

Composite disease activity measures such as the DAS28 are routinely used in rheumatology practice to monitor the disease trajectory in RA.

Materials and Methods:

A prospective analysis of authors spouse a single patient with Rheumatoid Arthritis (RA) symptoms, being managed with Vit D supplementation, Ibuprofen when pain bothered and Kneecaps for last 5 years, is being monitored in this study at Bengaluru. The patient is aged 72 years, was diagnosed as RA positive through a blood investigation, in July-August 2019, and was managing the pain with allopathic DMARDs 2-3 times a year and kneecaps for last 3 months with limited walking indoors only. Based on a friend's personal experience she consulted an Ayurvedic doctor in the first week of May 2024 and is being managed through Ayurveda interventions for last one month. Though a single case is not enough to prove the efficacy, the author has tried to share his spouse's experience through this article to report perceived benefit by the patient. Most importantly, early identification of patients with discordant subjective and objective outcomes may facilitate optimal shared decision-making regarding Disease-modifying anti-rheumatic drugs (DMARDs) and pain management. However, large-scale randomized controlled trials are required to further validate the same.

Result: The interventions include Herbal Ortho pain Tablets 500 mg once a day and a Lepam powder to made into a paste dissolving it in Egg white and applied on both knees and left overnight to be cleaned next day morning, were prescribed for one month. Symptomatic assessment was done every week. Significant relief is observed by concurrent assessment of both objective and subjective components of the DAS28-P index by our case who reported a relief of pain by 25% and stiffness in the joint in 2 weeks' time.

Additional clinical assessment and communication are warranted when there is a suspicion of ongoing non-inflammatory pain despite adequate control of disease inflammation.

Keywords: rheumatoid arthritis; allopathy; ayurveda; joint pain; swelling; tenderness; disease-modifying anti-rheumatic drugs (dmards); das28; das28-p

Introduction:

Rheumatoid arthritis (RA) is an inflammatory disease that affects the joints, which gets worse over time unless the inflammation is stopped or slowed. The disease is of variable severity ranging from mild inflammation in a few joints to symmetric involvement in multiple joints, mainly in the hands and

feet, with progressive increase in pain, loss of function and eventual joint destruction and deformity [1].

One of the oldest records of the disease is a brief description in the Rigveda, which dates to 1500 B.C. In the 9th century A.D., Indian physician, Madhava wrote a full description of Aamavata [2] but it was not until 1800 that the

disease, described by French physician Augustin Jacob Landré-Beauvais, was recognized in the western world. In 1859, British rheumatologist Alfred Baring Garrod, named the disease RA [2,3].

Human bone mass peaks by about the age of thirty and slowly decreases thereafter. Bone undergoes a continuous process of breakdown and formation so that every year approximately 10% of the skeleton in adults is remodeled. In RA, bone may be affected by structural joint damage (erosions) and osteoporosis. Osteoporosis is a condition of the skeleton's reduced bone quantity and quality. The causes of osteoporosis associated with RA include the effects of a) chronic inflammation, b) medication and lifestyle factors.

Arthritis medications play an essential role in controlling the progression and symptoms of rheumatoid arthritis. Starting treatment soon after diagnosis is most effective. The best medical care combines rheumatoid arthritis medications, Diet, Yoga, and other approaches.

The main types of RA medications in Allopathy are bisphosphonates like Alendronate, Risedronate, Ibandronate, zoledronate, Teriparatide, Denosumab, Calcitonin or Raloxifene.

In contrast Ayurveda advocates Panchakarma therapies by detoxifying the body, balancing the doshas, and rejuvenating the body, which help to reduce inflammation, pain, and stiffness in the joints. Symptomatic care is provided using internal medicines that can alleviate AAMA, and other procedures. Homeopathy advises Rhus Toxicodendron (Rhus Tox) for joint pain and stiffness that might worsen initially but improves with continued motion.

As lifestyle changes like, a healthy diet (eating wisely & regularly) rich in calcium and vitamin D, weight-bearing exercise, and sensible exposure to sunlight, avoiding stress and Practicing yoga, are essential parts of the therapy in all systems. Health education-*INFORMING, INVOLVING, EMPOWERING & CONVINCING (IEC)* to change lifestyle is an important management approach.

The 28-joint disease activity score (DAS28) is a widely used measure to assess disease activity in rheumatoid arthritis (RA). The DAS28-P index, a

derived proportion of the patient-reported pain and joint tenderness within the DAS28, has been utilized as a discriminatory measure of non-inflammatory pain mechanisms in RA.

This article is an attempt to compare the outcomes of Allopathic and Ayurvedic treatment in the author's wife's case. Though a single case is not enough to prove the efficacy, this article reports perceived benefit by the patient. However, large-scale randomized controlled trials are required to further validate the same.

Case Report:

Prabha is a 72-year-old lady suffering from knee pain for over 5 years. Progress is very slow and in the last 2 years she has been unable to squat on the ground. The pain generally did not interrupt her daily activities but worsened if she walked more than half a Km, so she had stopped her morning walks. For the last 3 months she had been wearing kneecaps on both knees if she had to go out to the market or visit some other families and there was a need to walk or climb stairs. Physical examination does not indicate much inflammation, there is swelling on both knees, but more on right knee. She was taking Ibuprofen (400mg) tablet, twice each day if pain increased after unavoidable extra walking for more than 2 Km for 2/3 days, or compelled to climb more than 15-20 steps, that too hardly 2-3 times in a year. Allopathic advise has reached a stage of suggesting Knee replacement, which our patient is not ready to go through.

Based on feedback of satisfied client and her friend she went to an Ayurvedic practitioner in the first week of May 2024. Apparently, the doctor asked if she had knee problem before even, she could settle in the patient's seat, no surprise as the gait of patient walking in gives this clue. After feeling her pulse and looking at both knees he gave her a box of medicines and a powder written as Lepamam with instructions detailed below.

1: Herbal Ortho Pain Tablets: 500 mg tablets to be taken once each night. The composition includes Shallaki, Giloy, Chob Chini, Ginger Haldi, Punamava, Ashwagandha, Suranjan, Trikatu and Kutaki, though the proportion of each of these is not specified. It claims to give relief from the pain etc.as shown on the box.



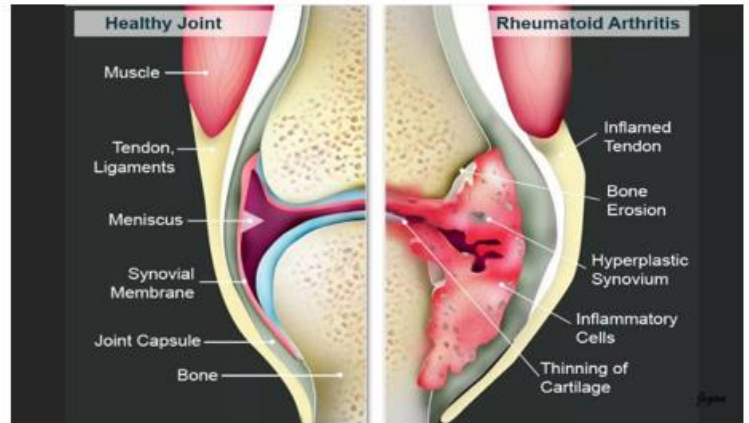
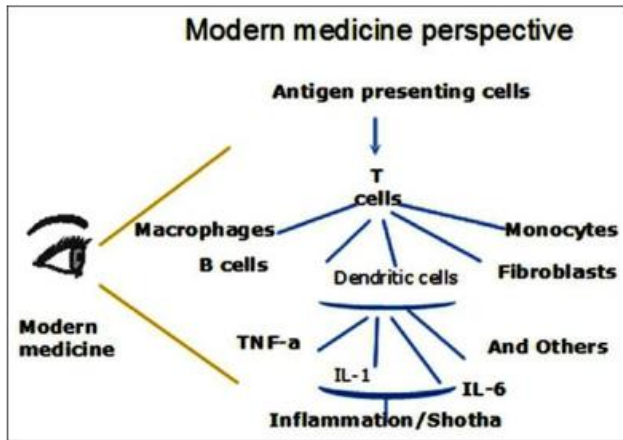
2. Lepamam Powder:

Handwritten on the box with no details of the contents. A spoon of this powder is to be made into paste in egg white and applied on both the knees and left overnight and to be cleaned in the morning. Most of it falls as dry powder in the bed by morning.

Having followed the instructions, the patient now feels 25% relief in stiffness in the joint and pain while walking. Last, week she went to a social function that involved both walking and climbing few steps and reported that she was comfortable even without the kneecaps, inferring the benefit of therapy.

Discussions:

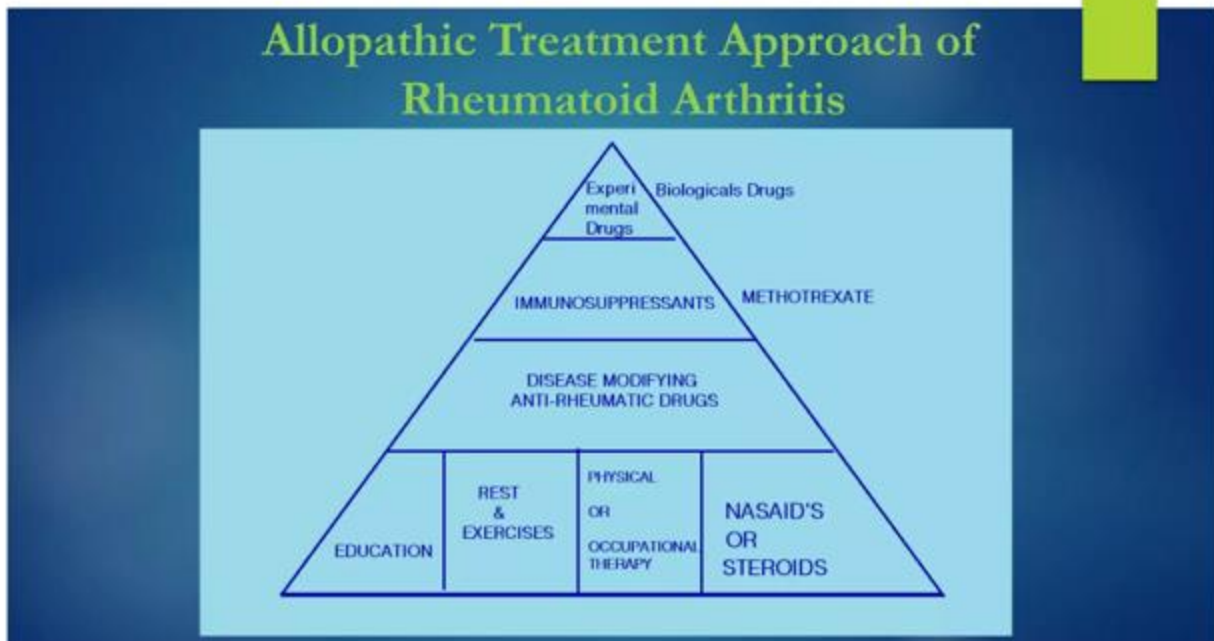
Understanding the pathophysiology of both systems will help the treating physician to institute a dual treatment plan of modern medicine's offense strategy and Ayurvedic medicine's defence strategy at appropriate stages of the disease. Studying the pathophysiology of the two systems also gives insight into the genetic and epigenetic phenomenon in the treatment of disease and opens the doors for groundbreaking research.



Pathophysiology

Modern Medicine: Rheumatoid arthritis is an autoimmune disorder in which the Immune system identifies the synovial membrane as "foreign "and begins attacking it. With long-term or intensive exposure to the antigen, normal antibodies become auto-antibodies that target self-antigens in the synovial membrane. First, the Antigen Presenting Cell (APC) usually a macrophage in synovium engulfs the antigen. Enzymes (peroxides) inside the APC break down the antigen into smaller particles and are transported to the surface of the APC and presented to T-cell receptor (TCR) {(CD4 - T-

helper cell) or CD8 (cytotoxic T cells)} recognizes and binds. Once the T-cell binds to the Antigen it becomes activated, the APC then secretes cytokines like i) Interleukin-1 (IL-1), ii) Interferon-alpha (IFN-a), iii) Interferon-gamma (IFN-g) iv) Tumor necrosis factor (TNF). APC also Secretes Lysozymes, Elastases and Collagenases these enzymes cause cartilage breakdown. On exposure to IL-1, synoviocytes proliferate and produce i) Interleukin-6 (IL-6) ii) Prostaglandin's, and iii) platelet-activating factor, which are responsible for the pain mechanism. Matrix Metalloproteases that cause activation of collagenase, an enzyme required for cartilage breakdown [3].



Of late people are turning to Alternate systems of medicines (AYUSH), as some of them are dissatisfied from the results of Allopathic drugs, as soon as they stop the medication, disease relapses. Most Allopathic Medicines cause side effects on long term use and they (especially Biological Drugs) are very expensive and beyond reach of common man.

The main types of RA medications in Allopathy, are bisphosphonates, which They slow down or prevent bone loss, strengthening bones by inhibiting osteoclasts which are responsible for breaking down and reabsorbing minerals such as calcium from bone and allow osteoblasts to work more effectively, resulting in improved bone mass. The most benefits happen

within the first five years of treatment and long-term use have been associated with atypical femur fractures, osteonecrosis of the jaw and esophageal cancer. Therefore, experts recommend bisphosphonate treatment for three to five years.

Allopathic treatment recommends 1) Disease-modifying anti-rheumatic drugs (DMARDs). 2) Biologic response modifiers (a type of DMARD) 3) Glucocorticoids 4) Nonsteroidal anti-inflammatory drugs (NSAIDs) and Analgesics (painkillers)

In the past, doctors took a conservative, stepwise approach toward treating rheumatoid arthritis. They started first with NSAIDs such as ibuprofen. Then, they progressed to more potent RA drugs for people who showed signs of joint damage. Today, most doctors in India, inform the patients and involve them in decision making for a goal to put the disease into remission and therefore take to an aggressive approach, which is often more effective; in reducing symptoms, better function, less joint damage, and disability.

DMARDs: Most used drugs include hydroxychloroquine sulfate, leflunomide, methotrexate, tofacitinib, baricitinib and Upadacitinib. Biologic response modifiers are a type of DMARD, target the part of the immune system response that leads to inflammation & joint damage.

Biologic response modifiers (BRMs): BRMs slow the progression of the disease or help put it into remission. These are prescribed along with methotrexate. Biologic response modifiers are taken by injection and/or by IV and are expensive.

Steroids: Steroids are strong anti-inflammatory drugs, that block other immune responses. Several man-made steroids called corticosteroids either as pills or injections help relieve RA symptoms and may stop or slow joint damage.

Because of the risk of side effects, it is generally recommended that you use these RA drugs only for brief periods; for example, when your disease flares up or until DMARDs are fully effective. If your side effects are severe, don't stop taking the drug suddenly.

Cost of Therapy: Medications, including NSAIDs, corticosteroids, DMARDs, and biologics, play pivotal roles. Monthly costs for these medications range from INR 10,000 to 30,000. The average cost of illness of RA patients in 2013 was estimated as INR 2230 (\$34)/month in 2013 in study of 200 patients in Amrita institute of medical sciences, Kochi, Kerala [12]

Ayurvedic Approach to RA: In contrast to modern medicine, Ayurveda explains RA using "Pancha" . "Doshas" Doshas are the three Energies derived from the Five Elements (Panchmahabhutas), responsible for all pathophysiological processes within the body. When these energies are imbalanced, they cause disease in the body. Ayurveda explains the phenomenon as three Bio – Energies (Vata Energy, Pitta Energy & Kapha Energy- VPK) and two elements collide, to form an energy called Dosh. The system further clarifies saying Vata Dosh Energy controls bodily functions associated with motion, Pitta Dosh Energy that transform food into energy and controls body's temperature and Kapha Dosh Energy that builds up tissues and controls growth in the body. When V P K Bio-Energies

are balanced (Samya Awastha), condition is conducive to well-being, health, and wellness.

Ayurvedic Perspective Amavata:

In the pathophysiology of Aamavata, the initial event is described as the "mistake of the intellect" or Pragyaparadha. As we experience the outside world with our five senses and start imitating others, we lose that connection to the source. As a result, we start consuming food not conducive to our body and follow a lifestyle not suitable to our body. The primary event of "mistake of intellect" or Pragyaparadha occurs in the following three areas of Diet, activity of mind and daily regimen. The result of Pragyaparadha leads to three Doshas or Tridosha disequilibrium: This is based upon unique combination of three bio-principles called Doshas viz. Vata, Pitta, and Kapha (VPK). People with predominant Vata or Kapha Prakriti and/or their disequilibrium are more likely to suffer from Aamavata/RA. And are likely to have decreased digestive-metabolic fire or Agni in the body resulting in impaired digestion & absorption of food, leads to formation of an immunogenic and toxic substance called AAMA, the causative factor for inflammation. Restoration of Agni and correction of imbalanced state is an important component of treatment strategy in Ayurveda.

Looking at the parallel and relationship between the genome and Prakriti. The genotype of a person is identified at the sub-cellular level. On the other hand, Prakriti is identified by the phenotype determined by structure, function, and mental activity. After birth, many changes start to occur in the body due to growth and aging. This change in Prakriti is called Deha Prakriti. According to Ayurveda, when there are excessive environmental, dietary, and life-style changes experienced by the body, disequilibrium, or "Vikriti" a precursor to disease.

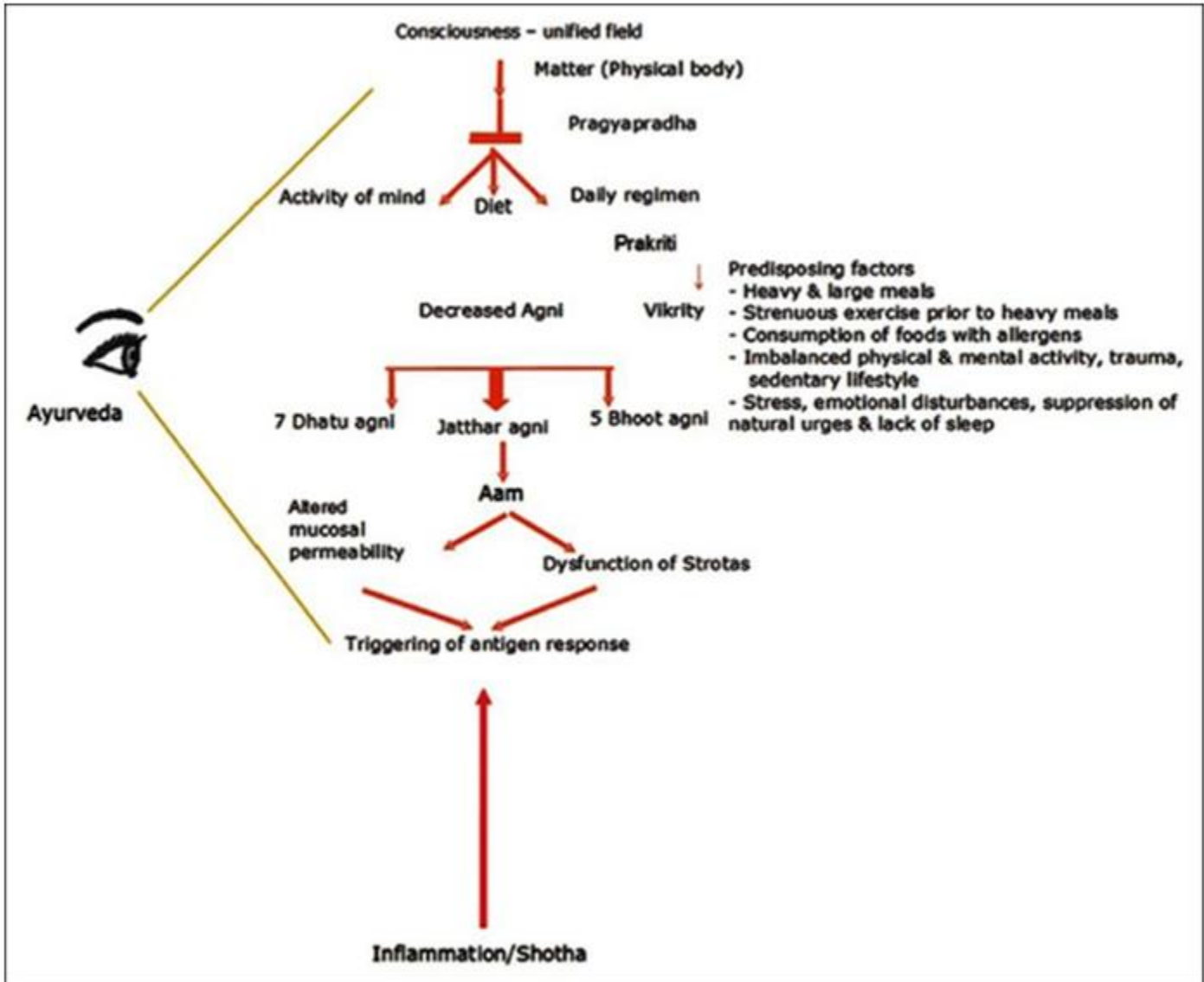
Decreased Agni or metabolic fire: Agni corresponds to enzymes, chemicals, hormones, neurotransmitters, and cytokines known to modern science. There are 13 Agnis categorized into the three groups based on their functions responsible for the entire process of digestion of food and all aspects of metabolism, including elemental/molecular metabolism.

Jatharaagni works at the gastrointestinal tract for digestion and assimilation of food. It is the strongest of all Agnis and is most important in the pathogenesis of RA/Aamavata.

The second set of five Bhutagnis is for elemental/molecular metabolism dealing with the five Maha Bhutas or five basic elements of physical matter.

Third set of seven Dhatus or tissue Agnis transform or metabolize 20 Gunas (qualities) of food into body tissues.

Ayurvedic Perspective Amavata



When these Agnis are depleted due to continued lifestyle errors and faulty eating, the body begins producing a range of unwanted and unfinished byproducts called Aama which accumulate in the body and block the micro channels or Strotas of the transport system of the body in varying degrees. As Aama is a toxic, biologically unwanted and antigenic product, the body tends to react to it and reject it. Such a blockade effect and antigenic reactive process gives rise to a variety of diseases. RA is one of those diseases.

The human body is a composite of 10 trillion karyotypic cells and 100 trillion micro-organisms. Microbes provide nutrients to the body by helping metabolize various foods like plant carbohydrates and glycans in mother's milk, which cannot be digested by human enzymes. They also produce various vitamins like vitamin B2, B12, and folic acid. If foreign bacteria attack our body, they help the body's defense system to destroy them. Intestinal mucosa can selectively absorb the digested food and prevent the absorption of undigested, partially digested food or toxic substances in the body. Intestinal mucosal permeability and peristalsis is impaired in Aamavata. Inflammation is a common denominator in Aamavata or RA. Alteration of bacterial flora of the gut occurs because of lack of Agni and indiscriminate use of antibiotics. Impaired permeability and motility of the

gut results in absorption of not fully digested and partially detoxified food. It starts the chain reaction described earlier to cause inflammation [2,4].

LEPAM: Lepana is the external application of Ayurvedic (Herbal) medicated paste on any part of the body where pain associated with inflammatory conditions persists. Lepam absorbs the swelling and inflammation from the affected part transdermally. Herbs chosen according to the condition / according to the nature of the ailment, are powdered made into a paste by mixing with a suitable medium like egg white, decoction, or water and applied over the affected part. Common Ingredients of Lepam: Kunkumapoo, Kadamba Attar, Sandalwood Oil, Kevda, Vetiver, Turmeric, Pachaikarpuram (Camphor).

A 2023 case series documented the successful management of five cases of confirmed Amavata (Rheumatoid Arthritis). at the Arogyashala Rugnalaya Panchavati Nashik, Maharashtra, India. The patients were between the age of 39 to 70 years, were diagnosed as RA positive through a blood investigation, in July-August 2023, and were managed through Ayurveda interventions, which included Anshanrupi Langhana (Fasting), Sunthisiddha Jala (Medicated water) in a dosage of 250-500 ml a day, Ruksha Waluka Pottali Swedana (Dry steam), and Shothahara Lepa (Medicinal paste) for five

days. Symptomatic assessment was done every day and blood investigations were conducted after 5 days. Significant relief in all the cases was observed as per DAS28-P index scores. That study also recommended; large-scale randomized controlled trials are required to further validate the same [4].

Another study in 2012 comparing pathophysiology under both Allopathy and Ayurveda systems recommended a symbiotic management of RA. The suggestions include A) Patients with mild symptoms should use combination of anti-inflammatory agents, DMARDs, Panchacola, antioxidants, sesame oil massage, yogic exercises, Pranayama, and diet that includes all six tastes. B) The use of NSAIDs is avoided because of gastric irritation and possible need to use an antiulcer treatment, which reduces the Agni and may play a role in perpetuating AAMA deposition and thus inflammation. C) Defense strategy of treatment should be used in palindromic type of RA. During acute attacks they should be treated with anti-inflammatory agents until acute attacks subside. D) Patients with moderate and severe RA are treated aggressively with both offense and defense strategies including biological disease modifying agents also reported benefits of Ayurvedic treatment [5].

Cost of Ayurveda Treatment: Average cost of Rheumatoid Arthritis treatment is 6500. Our case's cost for the first month was INR 1000 only inclusive of doctor's consultation [4,5]

Culinary Herbs and Spices for an Anti-Inflammatory, RA-Friendly Diet [6]

Ginger: Ginger has anti-inflammatory properties, including the ability to suppress inflammatory molecules called leukotrienes and to synthesize prostaglandins, which cause pain and inflammation. In one study, 70 patients with rheumatoid arthritis took either 1,500 milligrams (mg) of ginger powder or a placebo for 12 weeks. The results suggested that improvement in RA symptoms is due to affecting the expression of certain genes.

Thyme: A fragrant herb has anti-inflammatory and antimicrobial properties that could be therapeutic for rheumatoid arthritis, and is the most used herbal medicine for RA.

Turmeric: A review published in 2021 of 51 studies found curcumin (the active ingredient that gives turmeric its yellow color) to have anti-inflammatory effects on RA.

Green Tea: Green tea contains polyphenols, which are antioxidant-rich substances that can help reduce inflammation, protect joints, and trigger changes in immune responses that would ease the severity of arthritis.

Cinnamon: One study found that when women with rheumatoid arthritis consumed four capsules of 500 mg of cinnamon powder daily for eight weeks, they had a significant decrease in blood levels of C-reactive protein (a marker of inflammation), as well as reduced disease activity, including tender and swollen joints.

Garlic: Garlic contains diallyl disulfide, an anti-inflammatory compound that decreases the effects of pro-inflammatory cytokines. Research has found that the administration of garlic prevents cartilage destruction and reduces inflammation.

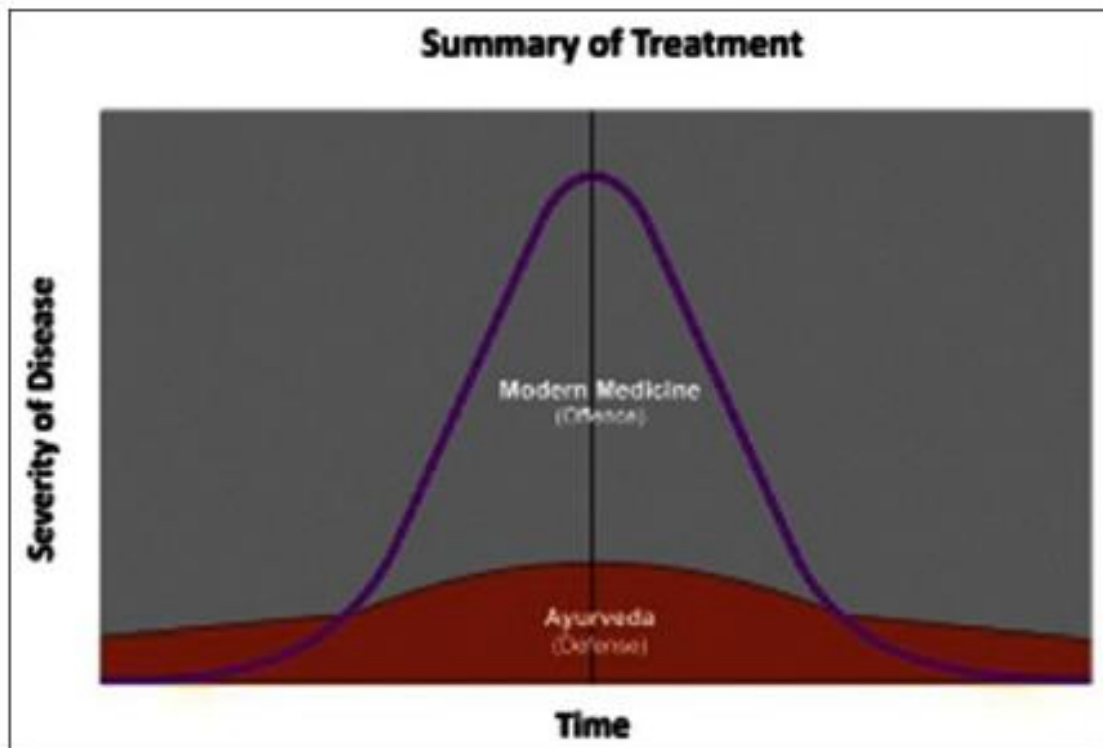
Black Pepper: Black pepper has antioxidant, antimicrobial, anti-inflammatory, and gastro-protective effects. A study suggested that the administration of piperinic acid administration relieved inflammation, pain, and other symptoms of arthritis.

Cayenne: Cayenne and other chili peppers contain capsaicinoids, which are natural compounds that have anti-inflammatory properties, according to the Arthritis Foundation.

F. Racemose: bark contains anti-inflammatory property against egg albumin denaturation method and has significantly more potent activity than other herbs [6].

Homeopathic treatments for RA:

Specific homeopath treatment intended for rheumatoid arthritis includes Rhus tox (poison ivy) arnica. Apis mellifica. Homeopathy claims that it is a better way of treating and helping RA patients as it has no steroidal composition that avoids further complications. It strengthens the immune mechanism of a patient to fight rheumatoid arthritis and control the condition to limits. Sometimes, a homeopathic treatment will initially worsen symptoms before showing an improvement. Known as a "homeopathic aggravation," proponents of homeopathy say this is a normal sign the medicine is prompting the body to heal itself [8].



Five most common drugs used in Homeopathy are:

Causticum: This is one of the primary homeopathic medicines used to treat rheumatoid arthritis along with by keeping the affected area warm when there are joint deformities.

Caulophyllum: This is an effective medicine for rheumatoid arthritis and is commonly used for women. This medicine is mostly used to treat arthritis of fingers of your hands and feet. It is used when small joints are affected more, compared to the larger joints in the limbs.

Colchicum: This homeopathic medicine is usually required during chronic stages of rheumatoid arthritis. It affects several tissues such as periosteum, synovial membranes, and other muscle tissues.

Ledum Pal: This medicine is used in the cases of rheumatoid arthritis where the rheumatoid starts in the feet and travels upwards spreading to the upper joints of the body.

Bryonia: This is an excellent homeopathic medicine for rheumatoid arthritis, used when all the joints and joint membranes are swollen and affected [9].

Cost of Homeopathic Treatment:

Medical management in homeopathic system is roughly about ¼ of Allopathic system, costing about INR 2000-300 per month [8-9].

Conclusion:

Rheumatoid arthritis (RA) is an inflammatory disease that affects the joints, which gets worse over time unless the inflammation is stopped or slowed.

Arthritis medications play an essential role in controlling the progression and symptoms of rheumatoid arthritis. Starting treatment soon after diagnosis is

most effective. The best medical care combines rheumatoid arthritis medications, Diet, Yoga, and other approaches.

In India medical management of all three systems of Allopathy, Ayurveda, and Homeopathy, is popular, however the treatment cost in Allopathy is almost 4 times of the other 2 systems.

Understanding the pathophysiology under all three systems, the author recommends a symbiotic management of RA

References:

1. Rheumatoid Arthritis Drug Types, Jabeen Begum.
2. Ayurvedic view on RA, Harish Kumar Verma.
3. Pathophysiology of Rheumatoid arthritis.
4. Anilrao Timande et.al, (2023). Ayurvedic intervention in the management of Amavata (Rheumatoid Arthritis): A Case Series Sanket
5. Gopal K. Basisht et.al (2012).Management of Rheumatoid arthritis (Aamavata) using symbiohealth healthcare system, , Ayu. 2012 Oct-Dec; 33(4): 466–474.
6. 14 Herbs and Spices for Rheumatoid Arthritis Symptom Relief.
7. In vitro anti-inflammatory activity of Ficus racemosa L. bark using albumin denaturation method Ayu. 2018 Oct-Dec; 39(4): 239–242.
8. Homeopathy for Rheumatoid Arthritis: Does It Work?
9. Homeopathic Medicines to Treat Rheumatoid Arthritis!
10. Understanding-cost-of-rheumatoid-arthritis-treatment.
11. Cost of illness of rheumatoid arthritis in south India.

Annexrue:**DAS28 & DAS 28-P**

Using the derived 28-joint disease activity score patient-reported components (DAS28-P) index as a discriminatory measure of response to disease-modifying anti-rheumatic drug therapy in early rheumatoid arthritis, which uses following variables.

LEPAM: ESR

DAS28-ESR objective component

DAS28-ESR subjective component

DAS28-P

mHAQ

Fatigue

Helplessness

SF-36

Physical component score

Mental component score

Methotrexate dose

Leflunomide use (%)

Cumulative glucocorticoid dose, mg: median (IQR)

Total erosion score



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