

Various Treatment Aspects of Arthritis (Allopathic & Ayurvedic)

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Abstract: *Arthritis encompasses a spectrum of inflammatory arthropathies affecting individual joints (monoarthritis), a few joints (oligoarthritis) or many joints (polyarthritis). Arthritis damages the cartilage within joints resulting in degenerative changes including loss of function and joint instability. Ankylosing spondylitis (AS) is a chronic inflammatory condition affecting the spine and bone to tendon attachment area within the sacroiliac joint leading to back pain and progressive spinal stiffness. Rheumatoid arthritis is a chronic systemic autoimmune disease characterized by the simultaneous inflammation of the synovium of multiple joints, leading to joint damage (e.g. destruction, deformation and disability). Osteoarthritis is the most prevalent form of arthritis which may lead to disability.. Ayurvedic medicine uses complex treatment approaches including manual therapies, lifestyle & nutritional advice, dietary supplements and medication. Yoga is effective in many musculoskeletal conditions like chronic low-back pain, cervical spondylosis, osteoarthritis and RA. Due to the difficulty in monitoring the disease progression to detect the advanced manifestations of the diseases, drug-induced cytotoxicity and problems with drug delivery; nanoparticle therapy has gained the attention of the researchers. This review describes the various approaches to treat arthritis along with the proposal of new ideas and future directions in arthritis therapy.*

Keywords: Arthritis, Osteoarthritis, Rheumatoid arthritis, Drug Delivery, Nanoparticle Therapy

1. Introduction

Arthritis term is taken from Greek word which means 'the joint diseases'. Arthritis is either acute or chronic inflammation which causes pain in the affected joint along with the structural damage. Joint pain may be due to the injury which affects ligaments, bursae or tendons surrounding the joint. Injury may affect the ligaments, cartilage and bones within the joint. Arthritis may damage the cartilage of the joint which further may lead to instability of the joint and loss of function of the affected joint which affect the quality of life of the patient. There may be lots of reason for the joint pain like Osteoarthritis (OA), Rheumatoid Arthritis (RA), Injury to the joint and others. Sometimes arthritis affects the joint to such an extent that the patients may get permanent disability. There may be different kind of treatment approach depending on the cause and severity of the joint pain. Treatment of arthritis may include ayurvedic treatment, yoga, nanoparticles systems, allopathic treatment and surgery. However, best success rate may be achieved by the combination of both pharmacological and non-pharmacological treatment [1, 2].

2. Treatment of the arthritis

There is no permanent treatment for the arthritis. However, both pharmacological as well as non-pharmacological approaches are used to treat the arthritis. Arthritic pain is very common and may cause the life of patient very difficult as compared to other chronic conditions. The associated pain may be either nociceptive i.e pain occurs due to tissue injury or may be neuropathic which occurs due to the nerve injury. Osteoarthritis is most common arthritis affecting the human population [3].

2.1 Role of Yoga in the treatment of joint pain

Yoga is a comprehensive, multidimensional approach used to reduce the pain in various musculoskeletal disorders. It reduces the stress. Yoga is very important for the physical and mental wellbeing. Exercise is an important complimentary step in the treatment of musculoskeletal disorders. A lot of studies have shown the positive effect of the exercise (e.g tai chai) to arrest the pain. Researchers have shown the positive effects of the yoga in RA patients and their study also concluded that yoga don't aggravate the joint diseases [4,5]. The yogic movements & postures provide stretching, flexibility and strengthening of the weak muscles. They also provide relaxation of body and mind. Studies even suggest that one week of integrated approach of yoga therapy (IAYT) may be useful in decreasing pain in the joint and also increase the functional mobility [6,7].

2.2 Ayurvedic remedies used in the treatment of joint pain

The first line of management in ayurveda is Nidana Parivarjana i.e avoidance of causative factors. In ayurveda treatment of arthritis generally begins with snehana i.e oleation and swedana which stands for sweating and heating. The strength of this part of medicine is the use of natural remedies which are derived from plants and minerals. As per this system of medicine bio physiological forces i.e dosha and constitutions (prakriti) are the major factors determining the health and diseases. Some other factors like mind & metabolic fire i.e agni also play an important role to determine health and diseases. Researchers have proposed some anti-arthritic ayurveda plants showing their anti-inflammatory properties. These plants derived

medicines help to reduce inflammation in the joint and in turn reduce the joint pain (Fig.1.).

- Ricinus communis (Castor oil) Potent anti-arthritis
- Guggul extract (Commiphora mukul, Boswellia serrata) medicinal plant
- Withania somnifera } Common component of anti-rheumatic medicines
- Dashamool }
- Swarna bhasma }
- Triphala Churana }
- Guggul }

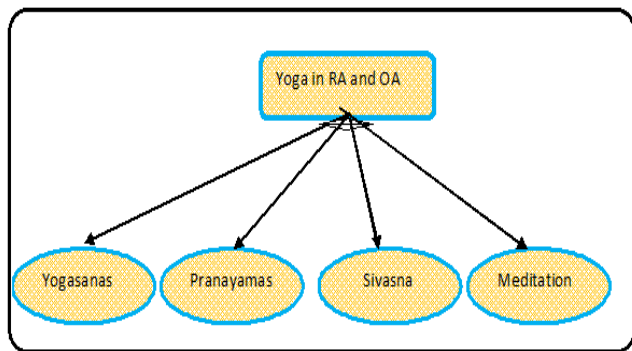


Figure 1: Diagrammatic presentation of various yoga's used in arthritis

Some of these have potent laxative action also in addition to anti-arthritis action [8-14].

- Herbal medicines in this category are kashayams, arishtams, gulikas, lehyam, and choornam
- Oil therapies includes- sneha-sweda, purificatory therapies includes-panchakarma chikitsa

- Therapeutic purgation includes- virechana
- Herbal pastes includes-lepa
- Medicated oils include oushadha siddha taila [15].

Researchers don't have any strong evidences which clarify that any treatment may restore the original structure and function of the damaged cartilage and synovial tissue in any type of arthritis. The patients are moving toward the ayurveda for the joint pain because conventional treatments are not giving results as per patient need [16]. Major mediator of inflammatory response in OA is pro-inflammatory cytokines which cause the degradation of articular cartilage in such patients [17]. These cytokines mainly produced in the synovium and cause inflammatory and destructive changes in the OA [18]. "Rosehip powder" derived from seeds of rosa canina, which also contain the vitamin-C have anti-inflammatory and anti-oxidative properties used in the treatment of OA [19]. Curcumin which is derived from the rhizomes of plant "curcuma longa" has anti-inflammatory, anti-oxidant and anti-catabolic properties are also used in the treatment of OA. IL-1β which is considered as the factor in the pathogenesis of OA is inhibited by "Curcumin" [20]. "Curcumin" can antagonize the IL-1β-induced caspase-3 activation, suppress IL-1 β-induced nuclear factor kappa light chain enhancer of activated B cells (NF-κB) activation & suppresses the glycosaminoglycan (GAG) [21]. "Resveratrol" present in grapes and peanuts have anti-inflammatory, immunomodulatory and anti-oxidative properties. It downregulates NF-κB pathway and inhibit IL-1β induced apoptosis in chondrocytes [22]. We can summarize the action of Rosehip powder, Curcumin and Resveratrol in Fig. 2.

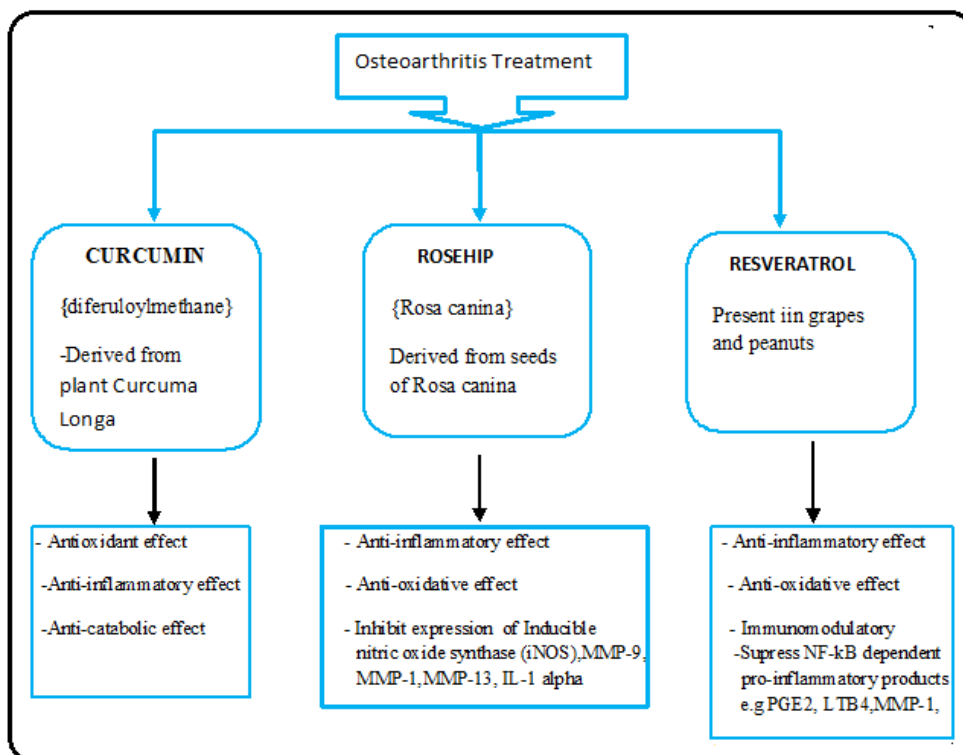


Figure 2: The schematic diagram of Rosehip powder, Curcumin and Resveratrol action in OA

2.3 Role of nanoparticles delivery system

All the particles at the nanometer scale having dimensions less than 100 nm may be considered as the nanoparticle. In the drug delivery system, larger sized nanoparticles of size more than 100 nm may be considered to load sufficient quantity of the drugs on the nanoparticles. Polymeric nanoparticles are colloidal materials whose size vary as per type of polymer, bioactive agent or processing method and the size of these nanoparticles range from few nanometers to few hundred nanometers. The main use of nanoparticles in the medicine are that it may deliver the drugs to the targeted tissues or cells. Targeted delivery of drugs to specific cells and tissues is one of the major uses of engineered NPs in medicine. Recently drugs like celecoxib, diclofenac, and ibuprofen have been tested against OA and found to significantly decrease the IL-6 and TNF- α in the synovial fluid (SF). Higher dosages of these non-steroidal anti-inflammatory drugs are effective to decrease the concentrations of pro-inflammatory cytokines in the SF. Inhibition of mitogen-activated protein kinases (MAPKs) was noted after non-steroidal anti-inflammatory drug treatment. In fact, it has good carrier capacity and can deliver both hydrophilic and hydrophobic substances [23]. To know the pathology and outcome of the treatment, researchers used many animals' models which resembles the human's arthritis progression like in OA. It's necessary to choose the appropriate models for the study. In preclinical models, researchers have used small animal model to understand the initial disease mechanism and therapy effectiveness. The fact behind choosing the small animal's model initially is due to rapid progression of diseases in them and low cost. Large animals' models may be used for late-stage development and validation of therapies. The best part of biomaterials are that they can target the articular cartilage and can stay in joint for longer time [24].

2.4 Allopathic treatment approach in case of arthritis

2.4.1 Rheumatoid arthritis

Early treatment of RA is necessary because if early intervention not done then it may lead to bone erosion [25].

- Nonsteroidal anti-inflammatory drugs (NSAIDs)
- Methotrexate monotherapy
- Combination therapy i.e. Combining of disease-modifying anti-rheumatic drugs (DMARDs)

DMARDs may be synthetic and biologic. Synthetic DMARDs are conventional (methotrexate, sulfasalazine, leflunomide, hydroxychloroquine, corticosteroids) and Targeted (tofacitinib). Biologic DMARDs are Tumor necrosis factor antagonists (adalimumab, golimumab, certolizumab pegol, infliximab, etanercept), IL-1 receptor antagonist (anakinra), IL-6 receptor antagonist (tocilizumab), Anti-CD20 monoclonal antibody (rituximab) and CTLA-4-Ig fusion protein (abatacept) [26] (Fig.3).

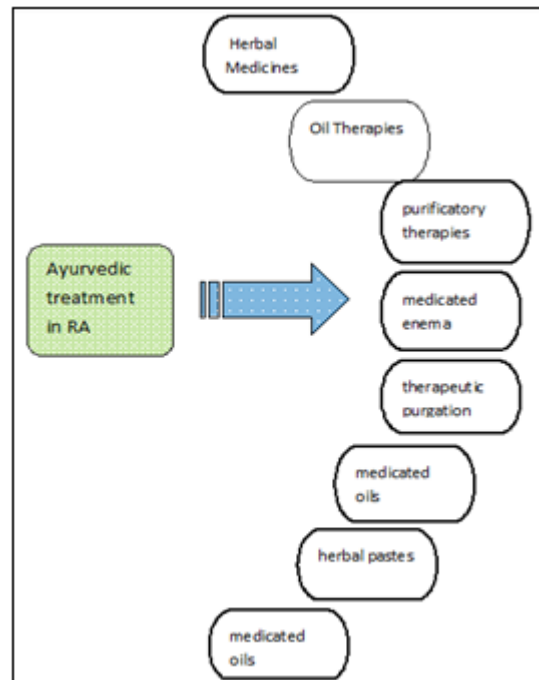


Figure 3: Schematic diagram of Ayurvedic remedies used in Rheumatoid arthritis

2.4.2 Osteoarthritis

- Simple analgesia- Both paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) are used in symptomatic treatments.
- Topical therapy- Topical NSAIDs, topical capsaicin,
- Glucosamine and chondroitin sulphate
- Intra-articular therapy
- Opioid analgesia

These all are common treatment approaches in osteoarthritis. A stepwise approach in the treatment of Osteoarthritis may be seen in Fig- 4 [27].

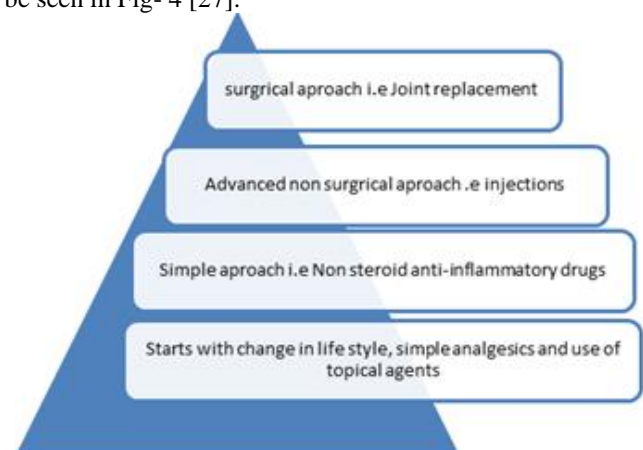


Figure 4: Sequential pyramidal approach in the management of arthritis

2.4.3 Gouty arthritis

- For acute gout- NSAIDs, Colchicine, Corticosteroids, Cortisone IA/IM, Interlukin-1 antagonist
- For chronic gout- Xanthine oxidase inhibitor (allopurinol, febuxostat), Uricosuric agent (probenecid), Selective inhibitor of URAT1 transporter (lesinurad) and Uricase (pegloticase) [28].

NSAIDs are commonly used in arthritis but they have many side effects on different systems of the body [29].

- a) NSAIDs have upper gastrointestinal (GI) complications,
- b) cardiovascular risks (Heart failure, Myocardial infarction etc),
- c) Renal complications (Sodium retention, Weight gain and edema, Hypertension, Acute renal failure, Papillary necrosis etc)
 - Hepatic (Elevated transaminases), Asthma/allergic,
 - Nervousness (Dizziness, confusion)

3. Conclusion

Arthritis can severely diminish the quality of life and may lead to depression. The treatment depends upon the type of arthritis involved. Either we can start with monotherapy or with combination of alternative treatment. Herbal medicines have negligible side effects as compared to the allopathic drugs. Allopathic medicines have systemic side effects on various organ systems like cardiovascular, renal, hepatic, nervous system etc. Yoga may be useful for mild cases. Yoga is useful to decrease pain and to improve the life quality of the patients. Nanoparticles delivery system may prove to be a great revolution in the treatment of arthritis in future. By combining of both NPs and cartilage targeting techniques, drugs may remain in the joint longer and can potentially avoid systemic side effects. The use of allopathic medicines and alternative medicines together may give best results. This modality may lead to the development of better disease modifying strategy which could improve symptoms and decrease the progression of arthritis.

References

- [1] Y. Kim, H.C Oh, J.W. Park, I.S Kim, J.Y. Kim, K.C. Kim et al., "Diagnosis and treatment of Inflammatory Joint Disease" *Hip Pelvis Journal*, 29, pp 211-212,2017.
- [2] M.U. Rezende, G.C. Campos, AF Pailo, "Current concepts in osteoarthritis" *Acta Ortopédica Brasileira*. 21,pp 120-122, 2013.
- [3] B.L. Kid, R.M. Langford, T. Wodehouse, "Current approaches in the treatment of arthritic pain" *Arthritis Research and Therapy*,9, pp 214-218,2007.
- [4] H Bhargav, M. Pa, S. Chobe, "Yoga module for rheumatoid arthritis" *Alternative and Complementary Therapies*, 22, pp1-6, 2016
- [5] S. Moonaz, O. Clifton, Bingham, L. Wissowm, S. J. Bartlett, "Yoga in sedentary adults with arthritis: effects of a randomized controlled pragmatic trial" *Journal of Rheumatology*. 42, pp 1194–1202, 2015.
- [6] S. Deepeshwar, M. Tanwar, V. Kavuri, R. B. Budhi, "Effect of yogabased lifestyle intervention on patients with knee osteoarthritis: a randomized controlled trial. *Front Psychiatry*, 9, pp80-82, 2018.
- [7] S. Moonaz, O. Clifton, Bingham, L. Wissow, S. J. Bartlett, "Yoga in sedentary adults with arthritis: effects of a randomized controlled pragmatic trial" *Journal of Rheumatology*, 42, pp1194- 1202,2015.
- [8] A. Chopra, M. Saluja, G. Tillu, "Ayurveda–modern medicine interface: A critical appraisal of studies of Ayurvedic medicines to treat osteoarthritis and rheumatoid arthritis" *Journal of Ayurveda and Integrative Medicine*, 1, pp 190-197, 2010.
- [9] U. Thatte , S. Chhabria , S.M Karandikar, S.Dahanukar, "Immunotherapeutic modifications by indian medicinal plants" *Indian Drugs*, 25, pp85-87, 1987.
- [10] U.M Thatte, S.A Dahanukar, "Immunotherapeutic modification of diverse infectious states by indian medicinal plants" *Phytotherapy Research*, 3, pp43-48, 1989.
- [11] B. Patwardhan, D. Kalbag, P. S Patki, B. A Nagsampagi, "Search of immunomodulatory agents: a review" *Indian Drugs*, 28, pp249-254,1991.
- [12] S.N. Upadhyay, "Therapeutic potential of immunomodulatory agents from plant products, Immunomodulation" *Indian Journal of Experimental Biology*, 8,pp 149-154,1987.
- [13] C.K. Katiyar, Brindavanam, P Tiwari, DB Narayana, "Immunomodular products from ayurveda: current status and future perspectives" *Immunomodulatory Agents from Plants*, 1, pp 289-323,1999.
- [14] N.N. Rege, U.M. Thatte, S.A. Dahanukar, "Adaptogenic properties of six rasayana herbs used in ayurvedic medicine" *Phytotherapy research*, 13,pp275-91,1999.
- [15] P.R.Kumar, "The efficacy of Ayurvedic treatment for rheumatoid arthritis: Cross-sectional experiential profile of a longitudinal study" *International journal of Ayurveda research*, 2,pp 8–13,2011.
- [16] M Ali, "Intersection of inflammation and herbal medicine in the treatment of osteoarthritis" *Current Rheumatology Reports*,14,pp 604–616,2012.
- [17] MB Goldring, SR Goldring, "Osteoarthritis" *Journal of Cellular Physiology*, 3,pp 626–634,2007.
- [18] J. Bondeson, S.D Wainwright, S Lauder, N Amos, C.E. Hughes, "The role of synovial macrophages and macrophage-produced cytokines in driving aggrecanases, matrix metalloproteinases and other destructive and inflammatory responses in osteoarthritis" *Arthritis Research and Therapy*,8,pp 187,2008.
- [19] R. Christensen, EM Bartels, RD Altman, A Astrup, H Bliddal, "Does the hip powder of *Rosa canina* (rosehip) reduce pain in osteoarthritis patients a meta-analysis of randomized controlled trials" *osteoarthritis cartilage*,16,pp 965–972,2008.
- [20] Y, Henrotin, A.L. Clutterbuck, D Allaway, EM Lodwig, P Harris, M Mathy-Hartert et al, "Biological actions of curcumin on articular chondrocytesosteoarthritis cartilage, 18,pp141-149,2010.
- [21] M. Shakibaei, T John, G. Schulze-Tanzil, I Lehmann, A Mobasheri, "Suppression of NF-kappaB activation by curcumin leads to inhibition of expression of cyclooxygenase-2 and matrix metalloproteinase-9 in human articular chondrocytes: implications for the treatment of osteoarthritis" *Biochemical Pharmacology*, 73,pp 1434–1445,2007.
- [22] C. Csaki, N. Keshishzadeh, K. Fischer, M. Shakibaei, "Regulation of inflammation signalling by resveratrol in human chondrocytes in vitro" *Biochemical Pharmacology*, 75,pp 677–87,2008.

- [23] J. M. Chan, L. Zhang, R. Tong et al, "Spatiotemporal controlled delivery of nanoparticles to injured vasculature," *Proceedings of the National Academy of Sciences of the US America*, 107,pp2213-2218,2010.
- [24] W.J. Zong, P.J. Borm, "Drug delivery and nanoparticles:applications and hazards" *International Journal of Nanomedicine*, 3,pp133-149,2008.
- [25] A. McLean-Tooke, C. Aldridge, S. Waugh, G.P. Spickett, L. Kay, "Methotrexate, rheumatoid arthritis and infection risk: what is the evidence" *Rheumatology*48,pp 867-871,2009.
- [26] G.S Hazlewood, C. Barnabe, G. Tomlinson, D. Marshall, D. Devoe , C. Bombardier," Methotrexate monotherapy and methotrexate combination therapy withtraditional and biologic disease modifying antirheumatic drugs for rheumatoid arthritis: abridged Cochrane systematic review and network meta-analysis" *British medical journal*, 353,pp777,2016.
- [27] D. Bhatia, T. Bejarano, M. Novo,"Current interventions in the management of knee osteoarthritis" *Journal of Pharmacy and Bioallied Sciences*, 5,pp30–38,2013.
- [28] B. Engel, J. Just, M. Bleckwenn, K. Weckbecker, "Treatment options for gout" *Archive of Deutsches Ärzteblatt International*, 114, pp 215–22,2017.
- [29] L. J. Croffor, "Use of NSAIDs in treating patients with arthritis" *Arthritis Research and Therapy*, 15,pp 223-228,2013.