

Management strategies for *Janu Sandhigata Vata* vis-a-vis osteoarthritis of knee: A narrative review

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Abstract

Introduction: Ayurveda has described about the pathogenesis and the treatment of various disorders, the incidence of some of which have increased in the present scenario. *Janu Sandhigata Vata* correlated with osteoarthritis (OA) of the knee joint is one such chronic, degenerative, inflammatory disease which has a great impact on the quality of the life of an individual. Different modalities of treatment have been explained in the classics to tackle the condition effectively. **Methodology:** In the present study, an attempt has been made to review the various clinical research works done in the management of OA of the knee, which are registered in various research portal. In AYUSH Research Portal using the keywords Ayurveda-clinical research-musculoskeletal disorders-osteoarthritis of knee-*Janu Sandhigata Vata* and in PubMed using clinical research – Ayurveda-OA. The studies reviewed were categorized depending on the treatment used in the management of the condition. **Results:** Fifty three research works were registered under AYUSH Research Portal with 34 full papers. There were 12 research papers in PubMed, out of which 6 papers which dealt with OA of the knee were reviewed. Among these six, three already existed in AYUSH Research Portal. The results were discussed by categorizing the studies as per the treatment used. **Conclusion:** Among the papers reviewed, most of them dealt with few modalities of treatment rather than the complete classical line of the treatment. The evidence-based research involving multimodality treatment with long-term follow-up covering various aspects of prevention and cure has to be conducted which is the need of the hour.

Keywords: AYUSH research portal, clinical trial, *Janu Sandhigata Vata*, osteoarthritis/OA of knee

Introduction

Ayurveda, the holistic life science aims at physical, social, and spiritual well-being of an individual. The modalities of preventive and curative healthcare have been well expounded in this science and may offer comprehensive solutions for the multifactorial diseases of the humanity. Osteoarthritis (OA) is one such disease wherein a rise in incidence is being observed owing to faulty diet and lifestyle. The disease usually affects in the fourth decade, and the occurrence increases linearly with age.^[1] Unilateral OA is more prevalent in male and bilateral OA in female.^[2] It is a degenerative disease characterized by loss of articular cartilage and synovial inflammation, joint stiffness, swelling, pain, and loss of mobility being its hallmark symptoms.^[3] The disease has a propensity to affect the weight-bearing joints such as the knee and hip most commonly and is hence a potent cause of disability.^[4]

The symptoms of OA correlate with *Sandhigata Vata* explained under *Vatavyadhi*. *Sandhivata* is first described

by Acharya Charaka as *Sandhigata Anila* with symptoms of *Shotha* (swelling) which on palpation feels like a bag filled with air and *Shula* (pain) on *Prasarana* and *Akunchana* (pain on flexion and extension of the joints).^[5] Acharya Sushruta also mentioned *Shula* and *Shotha* in this disease leading to the diminution (*Hanti*) of the movement at joint involved.^[6] Madhavakara adds *Atopa* (crepitus in joint)^[7] as additional feature of it. The pathologic underpinnings of this disease are attributing to the aberration of *Vata* and *Kapha Dosh*a, affecting the *Asthi* (bone), *Sandhi* (joint), *Mamsa* (muscle), and *Snayu* (ligament). Comprehensive management of this condition in Ayurveda includes a judicious combination of external therapies (*Bahya Chikitsa*) and internal

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Access this article online

Quick Response Code:



Website:
www.ayujournal.org

DOI:
10.4103/ayu.AYU_24_16

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How to cite this article: Sharma A, Shalini TV, Sriranjini SJ, Venkatesh BA. Management strategies for *Janu Sandhigata Vata* vis-a-vis osteoarthritis of knee: A narrative review. AYU 2016;37:11-7.

medication (*Abhyantara Chikitsa*). The *Bahya Chikitsa* include *Janu Basti*, *Abhyanga* (massage), *Jalaukavacharana* (application of leech), *Agnikarma* (cautery), *Basti* (medicated enema), etc. *Abhyantara Chikitsa* include the internal medications in the form of *Churna* (powder of a single herb/combination of herbs), *Kashaya* (decoction), *Vati* (pills), etc. [Table 1].

Numerous research works have been carried out to study the effect of various management strategies for *Sandhigata Vata*. The current article reviews research work published in the AYUSH Research Portal and PubMed about the utility of various treatment modalities of *Janu Sandhigata Vata* (OA-knee).

Methodology

Scientific articles in English were searched in AYUSH Research Portal and PubMed. All research work recorded under the AYUSH Portal System, Ministry of AYUSH, Government of India, and in PubMed conducted till January 2016 were included for the review. The filters used in AYUSH research portal were (a) Medical system: Ayurveda, (b) Category: Clinical research yielding 2094 research works, followed by (c) Body system: Musculoskeletal, and (d) Disease: Osteoarthritis of knee yielding 53 research works graded as A, B, and C, which were graded so based on the WHO recommendations.^[8] Among these, under Grade A there were 13 articles, under Grade B were 15 articles, and under Grade C were 27 articles. Among these 53, the full text of 19 articles was not available but only abstracts. Of these 19, 5 were paper

presentations at the 4th World Ayurveda Congress, Bengaluru. Among the remaining 34 papers, 1 was a case study using Sri Lankan Traditional Medicine,^[9] 2 papers were similar in the content,^[10,11] and 2 papers were New Millennium Indian Technology Leadership Initiative (NMITLI) projects by the Government of India.^[12,13]

In PubMed, the works were searched using clinical research as a filter and keywords like Ayurveda-OA. Twelve papers were obtained out of which six were related to OA. Among these six papers, three were present in AYUSH Research Portal. One scientific paper related to *Agnikarma* in OA of the knee was found.^[14]

Results

The results of the different studies have been categorized and discussed under pharmacological and nonpharmacological interventions.

The primary criteria for inclusion of patients were similar in all studies and included the presence of the classical symptoms of *Sandhigata Vata* (OA), namely *Vata Purna Druti Sparsha* (swelling), *Prasarana Akunchanayoh Apravrutti* (difficulty in joint flexion and extension), and *Vedana* (pain). Other criteria was presence of tenderness, crepitus, stiffness of joints or difficulty in walking. Individuals within the age group of 40–60 years of either gender were included in most of the studies. The exclusion criteria was also almost similar and included individuals with other systemic disease, gouty arthritis, rheumatoid arthritis, and recent injury to the joint. Routine hematological; urine; stool examination; biochemical investigations such as fasting blood sugar, lipid profile, serum protein, serum calcium, radiological findings, and estimation of body mass index differed across the research works. The assessment of disease severity and treatment outcome were done using symptomatic parameters such as pain, ability to walk, joint movements, swelling, and tenderness. Radiological changes and standard assessment scales such as Western Ontario and McMaster Universities Arthritis Index (WOMAC), WOMAC scale for India, Visual Analog Scale (VAS) for pain assessment, Lequesne's index,^[15-17] Richie articular index,^[9,18] and Lysholm knee scoring scale^[19] were used to assess treatment outcome. Kellergen and Lawrence's scoring system was used to evaluate radiological finding in one study.^[20,21] Urinary CTAX (cartilage collagen breakdown product) assessment was done in one of the NMITLI studies.^[12] In certain studies, patients were allowed to take rescue medications such as ibuprofen, diclofenac potassium, and acetaminophen.^[15,16,22,23] Glucosamine sulfate was used in one of the treatment arms in two studies.^[12,24] Few studies used diclofenac gel in one of the treatment arms.^[25,26]

Discussion

Among the studies on osteoarthritis of the knee, indexed in the AYUSH Research Portal, forty of the studies have been

Table 1: Classification of studies based on type of intervention

Type of intervention	Number of studies
Pharmacological	
<i>Panchakarma</i>	12
<i>Virechana</i> (purgation)	2
<i>Matra Basti</i> (enema using medicated oil)	4
<i>Niruha Basti</i> (enema using decoction of herbs)	3
<i>Jalaukavacharana</i> (application of leech)	7
<i>Bahya Snehana</i> (application of oil externally) and <i>Swedana</i> (sudation)	7
<i>Janu Basti</i> (retention of oil on the knees)	02
<i>Shamana</i>	6
Ginger (<i>Zingiber officinale</i> Roscoe.) and its extracts	7
<i>Shallaki</i> (<i>Boswellia serrata</i> Roxb.) and its extract	13
<i>Guggulu</i> (<i>Commiphora mukul</i> Hook. ex Stocks.) <i>Yoga</i>	2
<i>Abhyantara Snehana</i> (oral administration of medicated ghee)	2
Herbomineral preparation	1
Nonpharmacological	
Traction	3
<i>Kalkapatra Bandhana</i> (application of paste leaf of herbs)	2
Electrotherapy/ <i>Agnikarma</i>	2
Others	11

reported as randomized trials. The number of groups in most of the studies varied from a minimum two to maximum of seven; very few ($n = 3$) had a single group assessment only.^[27-29] Some of the studies that involved two groups used nonsteroidal anti-inflammatory drugs (NSAIDs) or nonopioid analgesic as standard control medication^[12,15,20,22-24,30,31] while in others, two different Ayurveda oral medications and/or *Panchakarma* procedures were compared. The studies with three groups compared *Shodhana* (detoxification procedures), *Shamana* (palliative treatment), and the combination of both.^[17,19,32-40] Blinding and placebo control methods were used in few studies.^[12,20,22,41] Formal sample size calculations were not available in most studies; the sample size varied from 10 to 30, along with an insignificant number of dropouts in certain studies. The duration of the studies ranged from 10 days to 3 months mostly; six studies were conducted for 3 months duration, one study extended to 24 weeks,^[42] and another to 32 weeks.^[43] It was evident that studies with longer duration of treatment and multipronged therapies should provide more improvement. It may be attributed to the chronic nature of the disease *Sandhigata Vata* that requires extended treatment.

The assessment criteria considered in most of these studies were categorized as subjective and objective parameters. Most of the studies showed a significant improvement in symptoms such as pain, tenderness, stiffness, and the movements of the joint. The objective parameters such as WOMAC for India, VAS, Ritchie articular index, and Lesquene's functional index also showed a significant improvement. However, crepitus seemed to remain unchanged in most of the studies. Although WOMAC index is most acceptable and validated test, application of such measures in India requires certain modifications and adaptation as proposed in the WOMAC for India like difficulty in sitting on the floor with legs crossed, squatting difficulty, etc.^[44,45] Hence, it is preferable for future studies in the Indian population to incorporate this element. The mental status of the patient was assessed in only one study using Jung self-rating anxiety scale and Jung self-rating depression scale.^[46] Lysholm knee scoring scale was used in only one study.^[19] Radiological assessment was included in 18 studies but did not show improvements after treatment, probably owing to the short intervention. Very few studies assessed the serum calcium levels before and after the intervention; however, no change was reported.^[12,28,47] The authors also observed incorrect statistical analysis in many studies; though more than two groups and time points were being measured, the studies performed pairs and unpaired *t*-tests. Moreover, considering that the sample size was small, nonparametric measures might have been a better statistical test. Analysis of variance was performed in 14 of the studies. The studies on *Agnikarma* were not found in the AYUSH Research Portal, whereas in PubMed one work on *Agnikarma* was found. Most of the works found in PubMed were found in the AYUSH research portal.

Pharmacological intervention

Panchakarma (five detoxification therapies) and other procedures

In all the studies that combined *Shodhana* with *Shamana* showed better results. *Matra Basti* and *Tikta Ksheera Basti* relieved the pain and other symptoms significantly^[17,19,21,34,35,37,38,44,48-50]. Multimodal treatment such as *Shodhana* or *Shamana* combined with *Bahirparimarjana* therapies such as *Snehana* and *Swedana/Patra Pinda Sweda* with *Vatahara* (pacifying *Vata*) herbs enhanced the therapeutic effect.^[48] These procedures were exclusively used as prime therapy in the management of the disease. *Janu Basti* was done using *Bala Taila*.^[51]

Jalaukavacharana (leech therapy)

Jalauka is administered in the diseases associated with *Pitta Dosha* dominance. Leech therapy is said to induce pain relief through antinociceptive effects and counter irritation.^[26] Pain and WOMAC scores showed remarkable clinical improvement but no change was found in the joint crepitus.^[52] The leech saliva contains a number of pharmacologically active biological substances such as hirudin and hyaluronidase which are proved to have analgesic, anti-inflammatory, and anesthetic activities.^[53] The therapy proved more effective than the topical application of analgesics or NSAIDs.^[54] It has been proved through Doppler flowmetry that there is a significant increase in superficial skin perfusion following the leech application, especially 16 mm around biting zone. There are a regional analgesic and antiphlogistic effect by the substances present in the saliva of leech, enforced by hyaluronidase, as well as counter irritation might be the possible reason of improvement by treatment with leeches.^[26] It was more effective than diclofenac, and there was a significant pain relief, improvement in functional ability, and joint stiffness for 3 months with a single application of leech.^[55-57] A comparative study conducted between leech therapy and transcutaneous electric nerve stimulation (TENS) showed that leech therapy produced a significant reduction in Lesquene's index for pain and physical function and VAS index.^[58]

Shamana

Ginger (Ginger officinalis Roscoe.) extracts

The extract of ginger^[13] was tested for its efficacy against ibuprofen and a placebo ($n = 25$), the extract was effective in pain management.^[59] Few patients showed mild disturbances in the gastrointestinal system which was insignificant compared to the symptom related to disease.^[21] Ginger contains chemicals with an anti-inflammatory potential, and the effect might be attributed to actions on hydroxy-methoxy-phenyl compounds.^[31,60]

Shallaki (Boswellia serrata Roxb.) and its extracts

Shallaki is proved to act as an effective agent to reduce the pain and inflammation associated with the disease.^[18,61] Aflapin is acetyl-11-keto-beta-boswellic acid (AKBA) enriched *B. serrata* extract and nonacidic gum extract of *B. serrata* – *in vivo* and *in vitro* animal models showed better anti-inflammatory activity than 5-*loxin*. The study in which *Shallaki* ointment

application was advised along with internal administration of *Shallaki* showed enhanced results or better reduction in the pain and inflammation.^[47] The extract of *Shallaki*, 5-*l*-loxin is 30% 3-O AKBA, which showed a significant reduction in the pain. In this study, cartilage degrading enzyme matrix metalloproteinase-3 (MMP-3) from synovial fluid of patients was tested. There was a significant reduction in the enzyme thereby modifying the disease pathology.^[15,17] In the molecular pathogenesis of OA, proteolytic enzymes such as MMP are highly elevated in body fluids such as serum and synovial fluids which cause potential damage in cartilage tissues.^[41] The gum resin of *B. serrata* usually contains 43% boswellic acids which contain mainly 3-acetyl, 11-keto, boswellic acid which help to preserve the structural integrity of joint cartilage and maintain a healthy immune mediator cascade at the cellular level.^[62,63] It inhibits the activity of enzyme 5-lipoxygenase through a nonredox reaction in OA. It also acts as Cox-2 inhibitor, reduces pain and inflammation without affecting the gastric mucosa. It soothes the joint and also helps to treat levels of synovial fluid, making the entire structure lubricated, and easy to rotate or move.^[64] In carrageenan-induced inflammation model, 5-*l*-loxin treatment yielded a significant improvement in paw inflammation in albino Wistar rats.^[65]

Guggulu Kalpas and its extract

Different *Guggulu Kalpa* such as *Ashwagandhadhi Guggulu*, *Adityapaka Guggulu*, *Lakshadi Guggulu*, *Panchatiktaghrita Guggulu*, and *Rasnadi Guggulu* were used in different studies. There is no comparative study done to judge the efficacy of any two or more *Guggulu Kalpa* in the management of OA.^[29,32,33,36,37,66] The evaluation between internal and external treatment is been done which would not help to find the accuracy of the treatment. *Guggulu (Commiphora mukul Hook. ex Stocks.)* has shown anti-inflammatory and anti-arthritis activities in formaldehyde induced arthritis in albino rats.^[67] Similar results are reported against carrageenan-induced rat paw edema, granuloma pouch, as well as adjuvant arthritis.^[68] *Guggulu* is the potent inhibitor of enzyme, nuclear factor kappa-light chain-enhancer of activated b cells, which regulates the body's inflammatory response.^[69]

Haridra (*Curcuma domestica*)

The extract of *Haridra (Curcuma domestica)* was used as an anti-inflammatory drug in a trial and proved to be effective than the ibuprofen.^[24] Among the twenty active ingredients present in *Haridra*, curcumin inhibited the matrix degradation of articular explants and chondrocytes. It restores the type II collagen and glycosaminoglycan synthesis and decreases the production of MMP-3, -9, and -13.^[70] To improve the bioavailability of curcumin, it was combined with phosphatidylcholine designed as "Meriva" in a study. It showed a significant reduction in WOMAC, treadmill test distance, reduction in inflammatory markers such as interleukin 6 (IL-6), IL-1 β , and vascular cell adhesion molecule-1, and erythrocyte sedimentation rate.^[71] The bioavailability of *Haridra* was increased by combining with piperine in other study. This study showed an increased serum concentration of curcumin, extent of absorption of

the drug, and bioavailability.^[72] Curcuminoid, another active principle in *Haridra*, proved as effective as NSAID in a double-blind study inhibiting the cyclo-oxygenase-2.^[73]

Administration of medicated Ghrita (ghee) internally

As the bones involved in forming the joints are affected in *Sandhigata Vata*, the administration of *Ghrita* internally has proved effective.^[28,32] Plain ghee is said to contain Vitamin D which plays an important role to utilize calcium and phosphorus in blood and bone building.^[74]

Nonpharmacological

Traction

Traction combined along with the other treatments was taken in the individual trial. If not as a specific measure, when traction combined with other treatment modalities would yield a better result.^[36,39,51] It reduces the pain and the functional status of the joint affected.^[75] As per the principles of skeletal traction, 1/7th of body weight is to be employed for applying traction. It showed considerable improvement in WOMAC score.^[76] Electrotherapy was used only in one of the studies. Neuromuscular electrical stimulation is said to relieve pain and stiffness and improving function including walking time and ability to go up and down the stairs.^[77]

Topical application

Studies related to the topical application of oil, *Kalkapatra Bandhana*, and analgesic ointment have been conducted.^[25,30,39,62] Application of *Nirgundi Taila* along with internal administration of the same has a considerable reduction in the pain and inability to perform joint movements.^[30] *Nirgundi Taila* has shown the preventive effect on the development of formaldehyde-induced experimental arthritis.^[78] Studies have revealed that the lipid medium is highly suitable for penetration of the drug molecule through stratum corneum on this basis; it can be assumed that the oil used in *Nirgundi Patra Upanaha* serves as a lipoidal medium for penetration of drug molecules and exerts an immediate anti-inflammatory effect.^[79] A comparative study using orange oil/ginger oil for a massage with olive oil as control conducted in Hong Kong showed a significant reduction in knee pain, stiffness, and enhanced the physical function of the joint.^[80]

Agnikarma (Ayurveda cautery)

Only one research work related to *Agnikarma* was found in PubMed. In this study, *Agnikarma* using *Rajata Shalaka* and *Loha Shalaka* was done for four sittings with a weekly interval to compare the results. The incidence of the disease in *Vata Prakruti* person was about 26.6% as per this study.^[14] It was concluded that, Charaka opines *Agni* as to be important for *Shula* and also *Agnikarma* is superior in treatment of *Stambha*.^[81] Modern medicine opines that the blood circulation at the knee joint increases due to the therapeutic heat lending to supply of proper nutrition to the tissue. This helps to flush away the pain producing substances from the site and reduces local inflammation.^[82]

A comparative study between conventional and Ayurveda treatment is been registered in the PubMed and as "CARAKA

trial” in Cochrane database. The Ayurveda treatments included manual treatment and massage, nutritional advice, Yoga, specific consideration of selected food items and nutritional supplements, general and specific lifestyle advice, Yoga posture for knee, and daily self-applied home massage. Conventional treatments included quadriceps muscle strengthening exercises, local physiotherapy including manual therapy, friction massage, occupational therapy, advice for individual knee exercise, dietary advice for weight loss in overweight or obese, and medication if necessary described in pharmacological standards.^[83]

As OA is a chronic degenerative disorder, trials done for longer duration are essential to validate the efficacy and sustenance of effect of treatment. Glucosamine sulfate is utilized effectively in the present treatment scenario. Very few studies have emphasized on the *Pathya* (dietetics) that has to be followed which is significant as per Ayurveda.

Scope for further research

There is scope for the study on least used management therapies such as *Upanaha* (application of poultice) and *Agnikarma* (cautery). As OA is a progressive disorder, continuous medication is essential. Special consideration about the prevalence of the disease either in one knee or both, female if attained menopause, socioeconomic status, daily activities, dietetics, etc., is needed.

Conclusion

Ayurveda has emphasized on the *Nidana* (cause), *Samprapti* (pathogenesis), and *Chikitsa* (treatment) of the *Sandhigata Vata*. Various modalities of treatment including *Shamana* (palliative), *Shodhana* (detoxification), local treatments like *Upanaha* (poultice application), and *Agnikarma* (cautery) are described considering the pathophysiological constitution of an individual. The review showed that the studies which involved multi arm treatment showed a better relief in the symptoms. Depending on the stage of the disease and other assessment parameters, different treatment modules have to be incorporated. Research works done utilizing the possible, appropriate modalities of treatment depending on the cause and the pathogenesis with long-term follow-up is the need of the hour. Thus, the quality of life is greatly improved.

Acknowledgment

We are thankful to the Dr. Sriranjini S Jaideep, Vaidya Scientist Fellow Clinical Registrar, MS Ramaiah Indic Center for Ayurveda and Integrative Medicine, Gokula Education Foundation, Bangalore, for technical help.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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हिन्दी सारांश

सिसम्पेलाँस परेरा लिन. को एवं साइक्लिया पेल्टाटा (लेम) हुक.एफ. एंड थॉमस के एंटीपाइरेटीक

और एनॉलजेसिक गतिविधियों का तुलनात्मक अध्ययन

सुमन जी सिंह, के . निशतेश्वर, भूपेश आर पटेल, मुकेश बी नारिया

सिसम्पेलाँस परेरा लिन. को पाठा के एक स्थापित स्रोत के रूप में माना जाता है और साइक्लिया पेल्टाटा (लेम) हुक. एफ. एंड थॉमस को भारत के दक्षिण हिस्से में पाठा के स्रोत के रूप में उपयोग किया जाता है। शास्त्रीय ग्रन्थों में पाठा की दो विभिन्न किस्में जैसे राजपाठा (सिसम्पेलाँस परेरा लिन.) एवं लघु पाठा (साइक्लिया पेल्टाटा (लेम) हुक. एफ. एंड थॉमस) का उल्लेख किया गया है। प्रस्तुत शोध में सिसम्पेलाँस परेरा लिन. एवं साइक्लिया पेल्टाटा (लेम) हुक. एफ. एंड थॉमस की एंटीपाइरेटीक और एनॉलजेसिक गतिविधियों का तुलनात्मक प्रयोगिक अध्ययन चूहों में किया गया है। इन दोनों परीक्षणों के लिये औषधियों के चूर्ण एवं इथेनॉलिक सार का प्रयोग किया गया। एंटीपाइरेटीक गतिविधि का विश्लेषण चूहों में ब्रीवर यीस्ट प्रेरित पाइरेक्सिया से किया गया तथा एनॉलजेसिक गतिविधि का मूल्यांकन रेडिएंट हीट मॉडल और एसीटिक एसिड प्रेरित ब्रिथिंग सिंड्रोम द्वारा चूहों में किया गया। परिणाम से ज्ञात हुआ कि सिसम्पेलाँस परेरा चूर्ण की एंटीपाइरेटीक गतिविधि साइक्लिया पेल्टाटा के चूर्ण की तथा दोनों औषधों के इथेनॉलिक सार की अपेक्षा मध्यम हैं। सिसम्पेलाँस परेरा के चूर्ण ने दोनों औषधियों के इथेनॉलिक सार की अपेक्षा अच्छा एनॉलजेसिक परिणाम रेडिएंट हीट मॉडल में दिया। इसके विपरीत दोनों औषधियों के इथेनॉलिक सार ने एसीटिक एसिड प्रेरित ब्रिथिंग सिंड्रोम में दोनों औषधियों के चूर्ण की अपेक्षा अधिक प्रभाव दिखाया। इस शोध से यह परिणाम प्राप्त हुये कि दोनों ही औषधियों सिसम्पेलाँस परेरा एवं साइक्लिया पेल्टाटा में एनॉलजेसिक प्रभाव है परंतु यह साइक्लिया पेल्टाटा में तुलनात्मक दृष्टि में अधिक है।